INSTRUCTION MANUAL

for

THE MODEL MTR10-191 AND MTR25-191 FULLY SOLID STATE VHF FM MOBILE RADIOPHONE EQUIPMENT

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Issued by

THE MOBILE RADIO DIVISION
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HANDBOOK PRESENTATION

The format of this handbook allows for a complete technical description of the standard mobile radiotelephone, MTR 191A and B series, in separate sections.

SECTION ONE	-	INTRODUCTION
SECTION TWO	-	INSTALLATION INSTRUCTIONS
SECTION THREE	-	ALIGNMENT
SECTION FOUR	-	GENERAL SERVICE AND FAULT FINDING INFORMATION
SECTION FIVE	-	DETAILED SERVICE INFORMATION
SECTION SIX	-	SCHEDULE OF COMPONENTS

Various forms of mobile operations and fixed station applications, depending upon the customer's requirements, will be made the subject of a special addendum. Each addendum will contain all information, including circuits, if any, necessary to explain the relevant non-standard unit or the differences between that particular unit and standard.

PHOTOGRAPHS AND ILLUSTRATIONS

for the

VHF MOBILE RADIO TELEPHONE EQUIPMENT

CIRCUIT DIAGRAMS

for the

VHF MOBILE RADIO TELEPHONE EQUIPMENT

The diagrams are located at the rear of the Manual

SECTION 1 - INTRODUCTION

1.1 GENERAL

The equipment series designated Model 191 A and B are frequency modulated solid state Tx, Rx units operating in the 66-88MHz to 144-174MHz VHF frequency bands. The units are suitable for operation in a wide range of fixed station and mobile applications.

The equipment is manufactured in two basic formats:-

(a) Local Control Unit, reference Figure S1.1

(b) Extended Control Unit, reference Figure S1.2

The basic units are supported by an extensive range of auxillary equipment including adaption for remote control, alternative microphone and loudspeaker units and installation equipment suitable for the desired application.

1.2 MOBILE UNIT CODING

There are thirty two basic MTR-191 VHF series mobile radio-telephone equipments available. The variations include frequency band, power output (10 or 25 watt), channel requirements (up to 12 channels), under-dash and remote or extended installations.

The unit code may be divided into the following parts:-

Letter	Frequency Band
A	68 to 88 MHz
B	144 to 174 MHz

The output power indicated by the numerals following MTR.

The type of mounting denoted by the capital letter T following the frequency band letter for extended or remote mounting. Local control is denoted by the absence of such letter coding.

The number of channels indicated by the numeral following the frequency band letter or mounting configuration letter.

The operating frequency band designated by a capital letter following the code 191.

For example:-

MTR10-191AT4 is a 10 watt VHF low-band (68 to 88MHz) extended control, four channel unit.

and

MTR25-191B is a 25 watt VHF high-band (144 to 174 MHz), local control, single channel unit.

1.3 FACILITIES

Controls located on the equipment facia are:-

Volume	-	Controls the A.F. output
On/Off	-	Connects the battery supply to the equipment
Channel	-	Selects the required channel (not fitted to single channel units)
Muting	-	Controls the receiver mute operating level

Additional facilities mounted on the equipment facia are:-

Power on Indicator	-	Illuminates when battery supply is connected to the equipment
Transmit Indicator	-	Illuminates when transmitter supply is selected
Base Call Press-Button (Optional)	-	Initiates the base call and transmit facility
Car Call Reset Press-Button (Optional)	-	Initiates the reset of the call received indicator
Car Receiver Indicator (Optional)	-	Illuminates when a car call has been received
Car Call On/Off Selector (Optional)	-	Permits monitoring of the channel before initiating the base call or transmit function

Operation of the transmitter is controlled by a press-to-talk switch located on the hand microphone.

1.4 BRIEF DESCRIPTION

The MTR-191 series mobile equipments are designed to operate from the battery supply of the associated vehicle. The aerial can be fitted conveniently to the roof of the vehicle and

Figure S1.1

Basic Local Control Unit

Complete with Standard Microphone and Loudspeaker Units

Figure S1.2

Basic Extended/Remote Unit

Complete with Control Unit and Optional Loudspeaker Unit

1.4 BRIEF DESCRIPTION (Cont'd)

connected to the equipment by a concealed coaxial cable. The loudspeaker unit and the microphone clip may be fitted in any convenient position.

1.4.1 Transmitter

The transmitter is of narrow-band design and provides a nominal output power of 10 or 25 watts over the VHF high-band and low-band frequency ranges (144 to 174MHz and 68 to 88MHz respectively).

The maximum number of channels being twelve for 25KHz channel separation and a maximum deviation of 5 KHz.

The transmitter comprises a microphone amplifier with pre-emphasis and de-emphasis circuits, phase modulator, frequency multiplying stages and power output stages followed by a solid-state antenna switch and filter (common to transmitter and receiver circuits).

Crystal oscillators enable high frequency stability to be achieved over the frequency range.

1.4.2 Receiver

The single superhetrodyne receiver having a 10.7MHz I.F. frequency, comprises a RF amplifier (FET), balanced diode mixer, I.F. amplifiers, an integrated circuit limiter and discriminator module, muting circuit and A.F. pre-amplifiers and output stages. The muting circuit is noise operated and the A.F. output power is a nominal 3 watts into a 3 ohm termination.

1.4.3 Power Supply

The basic power supply is any suitable nominal 13.8V d.c. source independent of chassis polarity and is the supply for the transmitter R.F. output stages and the receiver A.F. output stage. The internal power supply board provides a stabilised +9V supply for the transmitter and receiver low level circuits and the antenna switching circuit, the voltage being applied to the appropriate circuit as determined by the operation of the microphone press-to-talk switch.

1.4.4 Microphone

Two types of microphone complete with interconnecting cable are available, a "pencil" light duty, noise cancelling type being supplied as standard equipment.

A heavy duty, rocking armature microphone can be supplied on request.

1.4.5 Loudspeaker

Two types of loudspeaker enclosures with interconnecting cable are available. The standard unit being a 6" x 2" speaker whereas a 6" x 4" speaker, primarily intended for industrial usage, may be supplied on request.

1.4.6 Antenna

The antenna supplied, complete with interconnecting cable is a quarter-wave length stainless steel whip for the appropriate frequency band.

1.5 MECHANICAL CONSTRUCTION

The mechanical construction of the basic unit is a shallow four sided open box formed by the front panel, two side panels and the rear panel. The circuitry is contained within two layers of printed-circuit boards held between the side panels with the transmitter section above the receiver.

The front panel carries the necessary operating controls and regulator board whereas the rear panel carries the antenna BNC socket and the P.A. heatsink. The side panels besides mounting the internal boards also provides for distribution of d.c. supplies.

The battery and loudspeaker are connected via spade terminals attached to leads projecting from the rear of the unit.

The equipment is contained within a sheet metal case and may be withdrawn by firstly removing the two 4BA screws at the outer edges of the rear panel and the two 6BA screws at the front edge of the side panels. (It may be necessary to also disconnect the battery, loudspeaker and antenna leads).

The mobile unit is held in position by means of a complementary mounting tray fixed in the desired location. The arrangement is self-locking, however, for security reasons provision is made for permanent fixing by means of a suitable lock and key.

1.5.1 Dimensions and Weight

10 Watt Transceiver

Dimensions	18.4 x 5.2 x 23.5 cms
Weight	1.9 kg.

25 Watt Transceiver

Dimensions	18.4 x 5.2 x 26 cms
Weight	2 kg.

Control Head (for boot mounted mobile units)

Dimensions	18.4 x 5.2 x 8 cms
Weight	0.5 kg.

1.6 COMPOSITION

The MTR-191 mobile equipment comprises the following units and boards.

Transmitter Unit comprising:-

- Microphone Amplifier Board
- Multiplier Board
- Power Amplifier Board
- Aerial Switch and Filter (common to receiver unit)
- Oscillator Board (common to receiver unit in single and four channel units)
- Hand Microphone

Receiver Unit comprising:-

- R.F. Board
- I.F. Board
- A.F. and Squelch Board
- Oscillator Board (common to transmitter in single and four channel units)
- Speaker

Power Supply Unit — Incorporates the regulated and 9V supply for the receiver, transmitter and aerial switching circuit.

Auxillary equipment required are included in the range of installation material.

A.F. Input for Maximum Deviation	0.5mV p.d. at 1KHz
Duty Cycle	E.I.A. Intermittent

1.7.3 Receiver

Sensitivity	0.35uV p.d. into 50 ohms for 12db SINAD
Quieting	0.5uV p.d. into 50 ohms for 20db of quieting
Signal to Noise Ratio	32 db minimum for luV pd RF input ± 5KHz deviation at 1000Hz modulation frequency
Spurious Responses	None greater than -80db referred to 0.5uV p.d. signal input
Selectivity	25KHz spacing ± 7.5KHz at -6db ± 25 KHz at -90db
A.F. Responses	Within +1db and -4db of the 6db/ octave pre-emphasis characteristic from 1KHz to 3KHz and within +1db and -8db from 1KHz to 300Hz (relative 1KHz)
Intermodulation	Better than 60db (E.I.A. three generator method)
A.F. Output Level	3 watts maximum into 3 ohms for less than 5% distortion
Muting Range	Adjustable between 0.25uV p.d. and 1.0uV p.d. RF input

1.7.4 Power Supply

Nominal Supply Voltage	13.8V d.c. (16.5V maximum)
Power Consumption	0.2A Receiver on standby 0.6A Receiver with 3 watt AF output 1.8A Transmit, 10 watts 4.5A Transmit, 25 watts

1.8 CRYSTAL REQUIREMENTS

1.8.1 Transmitter

Crystal -- Type K to specification STC 1012

Frequency Calculations:-

High-Band: Crystal frequency = $\frac{\text{Carrier Frequency}}{6}$

Low-Band: Crystal frequency = $\frac{\text{Carrier Frequency}}{3}$

1.8.2 Receiver

Crystal -- Type K to specification STC 1012

Frequency Calculations:-

High-Band: Crystal frequency = $\frac{\text{Carrier Frequency-10.7MHz}}{4}$

Low-Band: Crystal frequency = $\frac{\text{Carrier Frequency-10.7MHz}}{2}$

1.9 GENERAL SERVICE INFORMATION

1.9.1 Components

When ordering components, please quote the STC Part Number as shown in the schedule of components.

If it is felt necessary to further identify a component, quote:-

a. Circuit Reference Number e.g. C22

b. Circuit Diagram Number e.g. Oscillator Board Fig. 12

c. Physical location on sub-assembly

1.9.2 Equipment

When requesting information on the equipment, always state the following:-

a. Equipment type number e.g. MTR10-191A4

b. Circuit Diagram number for the particular sub-assembly e.g. Transmitter Multiplier Board Fig. 15

c. Serial number of equipment

d. If equipment is non-standard, or any special features

e. Carrier frequency

SECTION 2 - INSTALLATION INSTRUCTIONS

2.1 GENERAL

The Mobile Radiotelephone has been designed to provide efficient, reliable service and a long life under rugged conditions. To obtain the maximum efficiency of the mobile unit it is essential that the installation be carefully planned and executed.

Care must be taken in the choice of location of the component parts, mountings should be rigid and secure and where specified, efficient bonding to the vehicle frame ensured.

The equipment must in no way impede the freedom of movement of the driver or his access to instruments and controls. It should however be conveniently accessible to the operator.

The instructions are applicable to an installation for a standard vehicle and if carefully followed no problems should be encountered. However, for special applications or where any doubt exists, reference should be made to the supplier or his accredited service agent.

2.2 PACKING

The equipment for three types of installation i.e. Local (under dash), Extended Control and Remote Control are packaged in an expanded polythene container. The appropriate container comprises the component parts of the complete mobile kit assembly as follows:-

2.2.1 Local (Under Dash) Control - Refer to Figure S2.1

Mobile Unit, complete with microphone and bracket (E, A, 1 & 21)

Loudspeaker, complete with bracket and cable (B & 3)

Whip Aerial Assembly, complete with cable and plug (D & 2)

Mounting Tray, complete with two mounting brackets (16 & 17)

Battery Supply Cable Assembly (4, 5, 6, 7 & 19)

Suppressor Components (14 & 15)

Miscellaneous mounting hardware screws etc. (18)

Refer to Section 2.3 for further details

2.2.2 Extended Control - Refer to Figure S2.2

Mobile Unit, extended model (f)

Loudspeaker, complete with bracket and cable (B & 3)

Whip aerial assembly, complete with cable and plug (D & 2)

Mounting tray (16)

Control Head, complete with microphone, bracket and 7 feet of cable (C, A, 1, 21 & 8)

Suppressor Components (14 & 15)

Battery supply cable assembly (4, 5, 6, 7 & 19)

Miscellaneous mounting hardware, screws etc. (18)

Refer to Section 2.3 for further details

2.2.3 Remote Control - Refer to Figure S2.3

Mobile Unit, extended model (F)

Loudspeaker, complete with bracket and cable plus an extra 10 feet of extension cable (B, 3 & 10)

Whip aerial assembly, complete with cable and plug (D & 2)

Mounting tray (16)

Control head, complete with microphone, bracket and 7 feet of control cable plus an extra 10 feet of control cable (C, A, 1, 21, 8 & 9)

Suppressor Components (14 & 15)

Battery supply cable assembly, complete with 20 feet of cable (6, 7, 19, 11, 12, 20 & 13)

Miscellaneous mounting hardware, screws etc. (18)

Refer to Section 2.3 for further details.

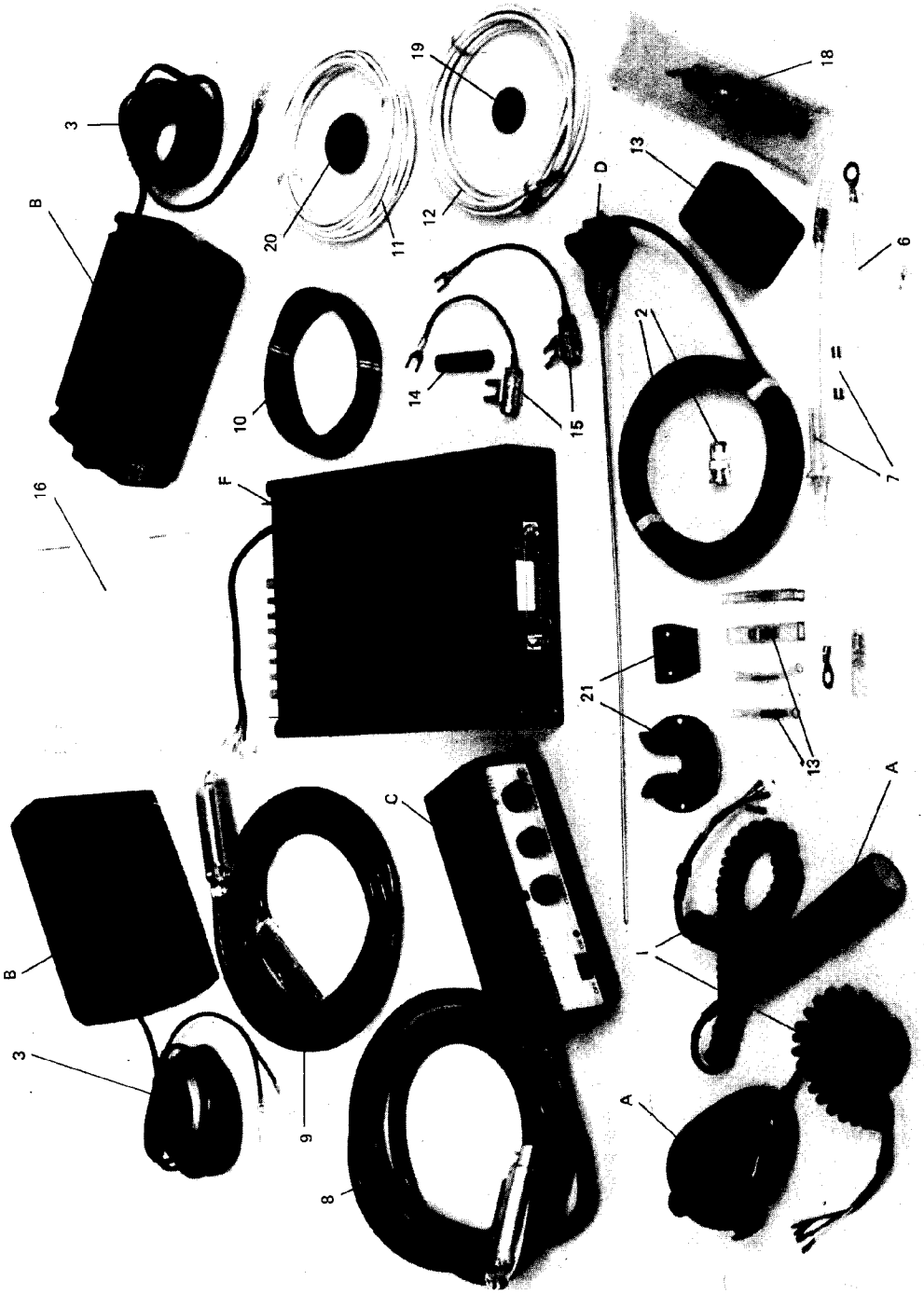


Figure S2.3 Remote Control Installation Kit

Ref. Nos.	Description	Type of Control Local	Ext.	Remote	Part Nos.
2	10 feet coaxial cable plus BNC Connector	1	1	1	Supplied with antenna assy.
B	Loudspeaker Assy.				
	6" x 2"	1	1	1	342163
	or				
	6" x 4"	1	1	1	351678
3	7½ feet twin lead (black)	1	1	1	342163 Supplied with loudspeaker assembly
	Kit Installation Hardware	1	1	-	351680
	Kit Installation Hardware	-	-	1	351681

The two "Kit Installation Hardware" assemblies are listed in the following table.

Ref. Nos.	Description	Kit Number 351680	351681	Part Number
4 & 5	7'6" dual battery lead assy (black and red)	1	-	342542
6	12" Power lead assy. (single white)	1	1	342543
7	12" Power lead fused assy. (single white)	1	1	342548
7	Fuse Auto 5 amp	1	1	259237
10	10' twin lead assy (black)	-	1	342525
11	20' lead assy (black 19/018)	-	1	342544
12	20' lead assy (red 19/018)	-	1	342545
13	Unit lead interconnection			
	Terminal Block	-	1	342783
	or			
	¼" Inline adaptor Q/C plus	-	2	342783
	3/16 Inline adaptor Q/C	-	2	342781
21	Pencil Microphone bracket	1	1	342296

In choosing the location of the transmitter/receiver unit ensure that there is adequate space to accommodate the mounting tray and that the supporting members such as the firewall or dashboard will carry the weight of the 2kg unit. Allowance should be made for the rear connections to the supply and aerial leads to the unit. Whilst examining the area, locate the nearest vacant hole, (perhaps in the firewall) which will accept the bush and battery cables provided. It may be necessary to cut a suitable aperture for this purpose.

Examine and feel for any obstruction which may interfere with the mounting of the aerial, for example, in the headlining of a vehicle intended for centre line roof mounting.

The loudspeaker should be mounted in any convenient position to provide the best possible sound reproduction.

The suggested tools necessary to carry out the installation are:-

a) Power drill with assorted drills.

b) A ¾" hole cutter for the aerial and firewall bush (if required).

c) A 1¼" hole cutter for the trunkwall bush (if required).

d) Screwdrivers (both standard "slotted" head and "posidrive" head screws are used) and spanners as required.

e) A bolt-cutter.

f) A multi-meter.

g) A VSWR meter (if possible)

Note:- Read the complete installation instructions before commencing installation.

2.4.2 Aerial Installation

The stainless steel ¼ wave-length mobile whip aerials are basically intended for vehicle centre roof top mounting. Alternative mounting is possible however but with a likely reduction of the aerials radiation effectiveness.

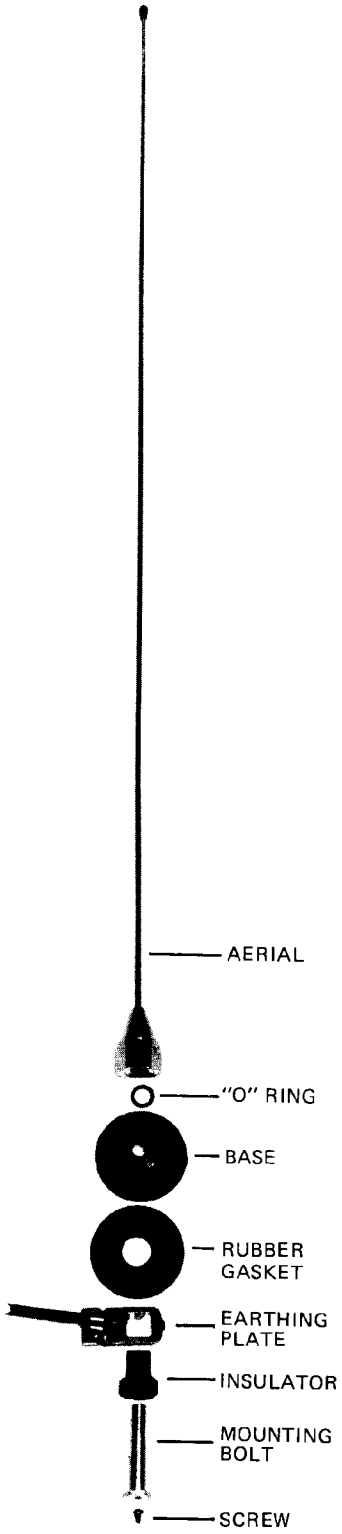


Figure S2.4

VHF Aerial

h) Ensure that the shoulder on the aerial base clears the hole and enters the cup in the base plate. Tighten the nut of the whip assembly and check that the protruding spikes of the base plate penetrate any remaining anti-drum compound and make good contact with the metal roof.

DO NOT OVERTIGHTEN THE NUT

i) Screw on the whip

j) Place the coaxial cable (in the corner post) through and under the dashboard to the transmitter/receiver unit. Refasten the lining and trim. Allow a few inches of slack on the cable and cut to length.

k) Strip the cable and connect to the coaxial cable plug provided.

l) Ensure that the sheath of the coaxial cable is connected to the car frame (through the aerial sub-assembly plate). Check with the ohm meter and if the resistance between the sheath and frame exceeds 0.1 ohms the sub-assembly plate must be reset to ensure a good contact through the metal roof.

m) Check for a high impedance reading between the centre conductor of the cable and the sheath, and continuity between the whip and the centre conductor.

n) The whip may now be cut to the desired frequency. The following graphs show the approximate length only, the adjustment varying according to vehicle roof size and shape. If a VSWR meter is not available simply cut the aerial length as per the graph. Note that the length indicated by the graph is measured from vehicle body to antenna tip.

the firewall, mark and drill two ¼" clearance holes. Secure mounting tray assembly.

d) Fit the bush in the firewall (cutting a ¾" hole if required) and insert the battery leads through to the battery area.

e) Fasten the leads to the vehicle wiring harness. Ensure that the active lead is fused.

f) Mount the mobile unit in the tray and connect the associated leads.

2.4.4 Mobile Extended Control Mounting

Extended control mounting is intended for front cabin location in vehicles which lack sufficient depth to mount the mobile unit within easy reach of the operator.

Extended control is obtained by a separate control head and interconnecting cable for extension up to 7 feet.

Refer to Fig. 26.

a) In general, mounting tray runners are not provided and the tray is mounted directly on the vehicle metalwork in any suitable position. Mark and drill four suitably spaced holes for fixing with No. 8 self-tapping screws, or 4BA screws and nuts as required.

b) Select a convenient location for the control head, ensuring easy access to the operator.

c) Fasten the battery leads to the vehicle wiring harness, ensuring that the active lead is fused.

d) Slide the mobile unit in position and connect the associated leads. Interconnection between the control head and mobile unit is with the multi-lead cable provided.

2.4.5 Mobile Remote Control Mounting

Remote control mounting is intended for operation of the mobile unit in any suitable location up to 17 feet from the control head. Refer to Fig. 26.

a) Select a suitable location for the mounting tray, mark and drill four suitably spaced holes for fixing with No. 8 self-tapping screws.

2.4.8 Loudspeaker Installation

a) The standard 6" x 2" boxed speaker is supplied with a mounting bracket attached to the box structure by thumb screws. Suitably position the speaker for maximum sound reproduction. Mark and drill three holes for fixing the bracket with No. 8 self-tapping screws.

The 6" x 4" boxed speaker may be mounted either horizontally or vertically in three planes.

Attachment is made with either a single coach head bolt or by two No. 8 screws. Separate the box (four screws in the front grill) and mark and drill to suit. Fix the rear housing and re-attach the speaker and grill.

In the event of the single coach head bolt being used, employ the two ¼" washers provided, as spacers between the box and the metal chassis.

b) The speakers are complete with 7½ feet of twin "figure 8" lead with suitable end terminations. In local and extended control mounting this length of cable is quite sufficient. However in remote control mounting an additional 10 feet of cable, with end connectors, is supplied.

Connection between the mobile unit leads and loudspeaker leads are made via double male spade connectors mounted either in a single terminal block or individual 3/16" "inline" flying lead adaptors.

2.4.9 Battery Supply Connections

Refer to Fig. 26.

Connection to the battery supply is made via the low tension supply leads. Initial connection is made by two while leads (one fused) having suitable terminating lugs. The fused lead is attached to the battery active terminal, generally on the starter solinoid. The remaining lead is attached to the chassis under a convenient bolt or screw.

Connection to the mobile unit in local and extended control versions is made via a red (positive) and a black (negative) lead having suitable spade terminations. The leads from the mobile unit being passed through a

Multiple entry holes are provided in the control head and thus the cable entry may be altered to that most convenient for the application.

Mounting is by means of either two No. 8 self-tapping screws or 4BA nuts and screws as required.

2.4.11 Mobile Unit Connections

Refer to Fig. 26.

The battery power supply and loudspeaker leads are attached to spade lugs on flying leads projecting from the rear of the unit. The antenna connection being made via a BNC socket located on the rear panel.

The lead colour-coding is as follows:-

Red/Blue	Battery positive
Black/Green	Battery negative
White	Loudspeaker
Black	Loudspeaker (unit earth)
B.N.C. socket	Antenna

2.4.12 Storage

The mobile unit and associated equipment may be stored for an unlimited period of time in a "normal" environment.

Perhaps the only precaution is to ensure that the magnet associated with the pencil microphone has a keeper attached. Depending upon the manufacturer of the magnet the keeper that is supplied may be either a suitable section of steel or the microphone bracket itself.

2.4.13 Chassis Drilling Table

A suggested table of drilling sizes to suit various self-tapping screws together with typical sheet steel thickness is tabulated as follows:-

Diameter of Screw	Steel Sheet Gauge	Diameter of Hole	Drill Size
No. 4	24	.089	43
0.114"	22-20	.093	42
	18	.096	41
No. 6	24-22	.106	36
0.139"	20	.110	35
	18	.111	34
No. 8	24-20	.116	32
0.166"	18	.128	30
No. 10	26-18	.144	27
0.189"			

Figure S2.7 Drilling Table

2.5 COMMISSIONING

After completion of the installation and before switching on, carry out a detailed check that the installation instructions have been carried out and that all connections, plugs and fastenings are secure.

Switch on and check that the supply lamp is indicating. Set the MUTING control such that muting occurs above noise threshold.

Listen and if the channel is clear establish a testing call to the base station.

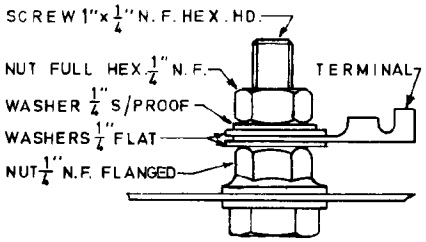
In the event of difficulty in either transmitting or receiving the unit should be checked in accordance with the procedure in Section 4.

suitable hole in the firewall to the battery. (It may be necessary to cut a suitably positioned ¾" hole and use the plug seal supplied).

In the remote control mounting an additional 20 feet of red and black lead is used. The vehicle polarity determines the battery lead which is to be cut to suit appropriate chassis earth return connection. Note however, that it is not necessary and in fact may not be possible or desireable to employ chassis earth return. In which case full length dual leads are used. Should chassis return be employed it is essential that adequate low resistance connection is made. The use of the serrated flange as shown in Fig. S2.6 is sufficient to obtain metal to metal connection.

Figure S2.6

Earthing Flange



Connection between the mobile unit leads and the battery leads are made via double male spade connectors mounted either in a single terminal block or individual ¼" "inline" flying lead adaptors. The leads may be fed through the 1¼" hole cut in the trunk wall to pass the unit interconnecting control cable and a ¾" hole cut in the firewall to the battery compartment (unless a suitable firewall hole exists). Self sealing plugs are supplied for each type of hole size.

2.4.10 Control Head Mounting

Refer to Fig. 26.

The Control Head is applicable to extended and remote operated units only. For extended control the interconnection is made with the supplied 7 feet of multi-lead cable and is quite straight forward.

In remote control, an additional 10 feet of such cable (complete with connectors) is also supplied. It is necessary however to drill a 1¼" hole in the trunk wall to enable the cable and connector to pass through from the unit to the control head. A suitable self-sealing plug is supplied and should be used.

b) Select a convenient location for the control head, ensuring easy access to the operator.

c) Fasten the battery leads to the vehicle wiring harness, ensuring that the active lead is fused.

d) Slide the mobile in position and connect the associated leads. Interconnection between the control head and mobile unit is with the 7 feet of multi-lead cable plus the 10 feet extension cable provided.

2.4.6 Microphone Installation

a) Select a convenient location on the dashboard front panel, providing easy access for the operator.

b) Mark and drill two holes for fixing of the microphone bracket. The pencil microphone bracket uses two No. 2 screws whereas the heavy duty microphone uses two No. 6 screws.

c) The microphone cord may be dressed for left or right hand entry into the side of the unit to ensure that the cord will not cause obstruction to the operator.

d) The pencil microphone is held magnetically to the mounting plate whereas the heavy-duty microphone is mechanically held in a suitable recess.

2.4.7 Suppressor Installation

a) Most modern vehicles are fitted with carbon ignition leads and thus the series resistance suppressor is not required. If required however the suppressor should be in series with the distributor H.T. lead, as close as possible to the distributor head.

b) A capacitor should be connected across the output terminal of the generator or alternator and frame (usually the thicker lead of the generator). A second capacitor should be connected from the battery side of the distributor to frame.

The flexible lead of each capacitor is connected to the appropriate terminal and the capacitor body is bolted to the most convenient earthing point on the vehicle.

WARNING do not connect the capacitor to the field terminal.

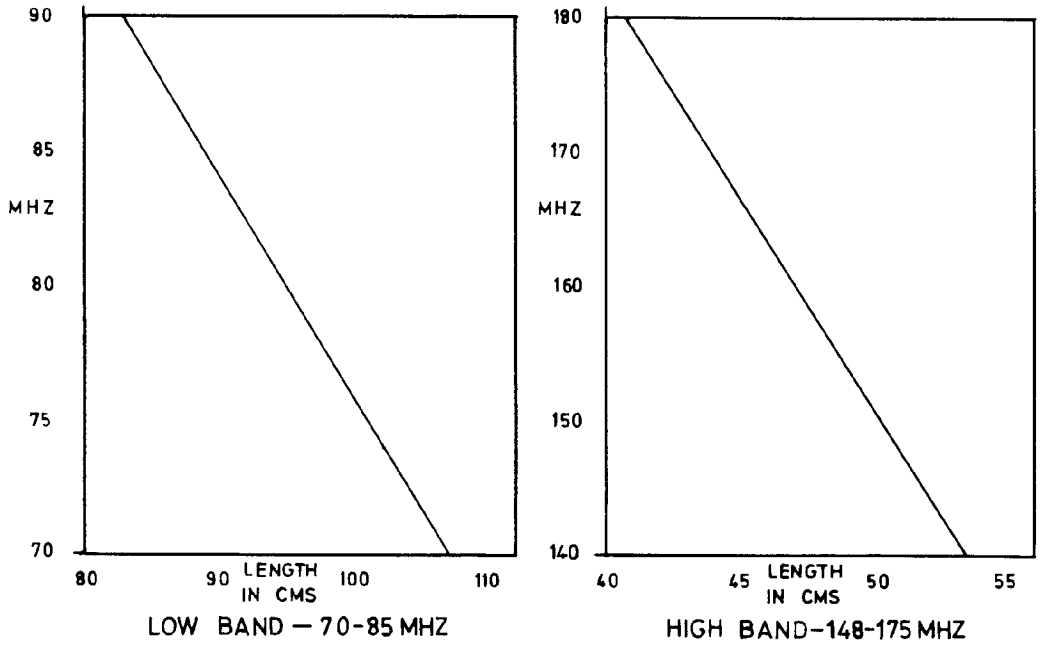


Figure S2.5 Aerial Adjustment Charts

If a VSWR meter is available connect the antenna to the mobile via the VSWR meter and cut the whip for minimum VSWR as indicated by the meter using the transmitter RF power as the source.

2.4.3 Mobile Local Control Mounting

Local mounting is intended for front cabin location where the vehicle has sufficient depth to mount the unit within easy operator reach. Refer to Fig. 26.

a) Determine the exact position of the tray to be mounted with the front of the mobile unit in line with the dashboard. Ensure that there are no obstructions and that there is space at the sides for the microphone cable etc.

b) With the tray as reference mark and drill two holes in the dashboard underside to suit No. 8 screws.

c) Mount the two mounting runners to the tray using the screws and clamps provided. Mount the tray and assembly in position and slide the runners back to

The following method of mounting is applicable to the standard sedan vehicle but may be adapted for alternative positions.

a) Cut a ¾" hole through the centre line of the metal roof and remove the surrounding internal "antidrum" compound. Take care that the drill does not damage the headlining underneath.

b) From the inside, remove the trim from the windshield pillar and surround. Ease the headlining sufficiently free to pass the coaxial cable through from the hole in the roof and down via the windshield pillar to the underside of the dashboard.

c) Unscrew the whip assembly and remove the aerial base and gasket.

d) In general the cable is supplied with the aerial base attached. If this is not the case, strip back ¾" of outer cable and braid, secure the cable under the retaining saddle, twist the braid and solder to the earth tag. Leave 3/8" of insulation on the inner conductor solder the conductor to the centre bolt lug.

e) Feed the cable through the hole in the roof and draw all the slack through until the sub-assembly is adjacent to the hole.

f) Tilt the cable clamp end of the sub-assembly plate towards the front edge of the hole and slide the plate towards the front edge of the hole and slide the plate through, holding the screwed shaft with the special tool provided. Straighten the plate and centre in the hole.

g) Reassemble the aerial in the following order:-

(i) Rubber gasket
(ii) Aerial base
(iii) 'O' ring
(iv) Carefully remove special tool and screw the whip assembly in position.

Ref. Nos.	Description	Kit Number 351680	Kit Number 351681	Part Number
19	Plug (self sealing) ¾" dia.	1	1	342785
20	Plug (self sealing) 1¼" dia.	-	1	342784
14	Suppressor 5000 ohm	1	1	222147
15	Capacitor 500nF, 200V	2	2	289727
18	Miscellaneous mounting hardware	1	1	

Notes (i) Mounting hardware including a suggested usage instruction list is contained within each kit container.

(ii) When alternate equipment is supplied, the necessary extra mounting hardware is supplied with the item.

(iii) Mounting trays are common to all Models. Suitable holes are provided to allow the tray to be installed in the desired position.

(iv) The mounting brackets provided with "UNDERDASH" mobile installation kit will in most cases, not be required for the extended or remote control unit installation, and these are therefore not included with the extended or remote installation kits unless otherwise requested.

(v) Suitable mounting brackets are supplied with each microphone and loudspeaker depending on the type supplied.

(vi) Single or multi channel control heads are supplied with a 7 ft. extended cable terminated with a multi-plug and socket type connector. A matching 10' extension cable is provided with a trunk mounted installation.

2.4 INSTALLATION PROCEDURE

2.4.1 General

Check that all items supplied are free from damage or defects. In general it is left to the discretion of the user regarding the location of the items, comprising the MTR-191 mobile equipment, in the vehicle.

2.3 SCHEDULE OF MATERIAL

Items and quantities comprising the installation kit assemblies available in the MTR-191 mobile series are set out in the following paragraphs and should be read in conjunction with Figure 26, Figure S2.1, Figure S2.2 and Figure S2.3

TABLE OF CONTENTS

Ref. Nos.	Description	Type of Control Local	Ext.	Remote	Part Nos.
E	Mobile Unit (local control)	1	-	-	as ordered
F	Mobile Unit (ext. control)	-	1	1	as ordered
16	Mounting Tray Assy.	1	1	1	342272
17	Brackets (mounting tray)	2	-	-	342541
C	Control Head				
	Single Channel	-	1	1	351650
	or				
	Multi Channel	-	1	1	351651
8	Cable 7 feet				
	Single Channel	-	1	1	342394 supplied with control head
	or				
	Multi Channel	-	1	1	342380
9	Cable 10 feet				
	Single Channel	-	-	1	351682
	or				
	Multi Channel	-	-	1	351684
A	Microphone				
	Pencil	1	1	1	342200
	or				
	Heavy Duty plus	1	1	1	351677
21	Mounting Bracket	1	1	1	063536
1	Cable (microphone assy)	1	1	1	342209 Supplied with microphone
D	Antenna				
	¼ wave length whip				
	High Band	1	1	1	333149
	or				
	Low Band	1	1	1	333148

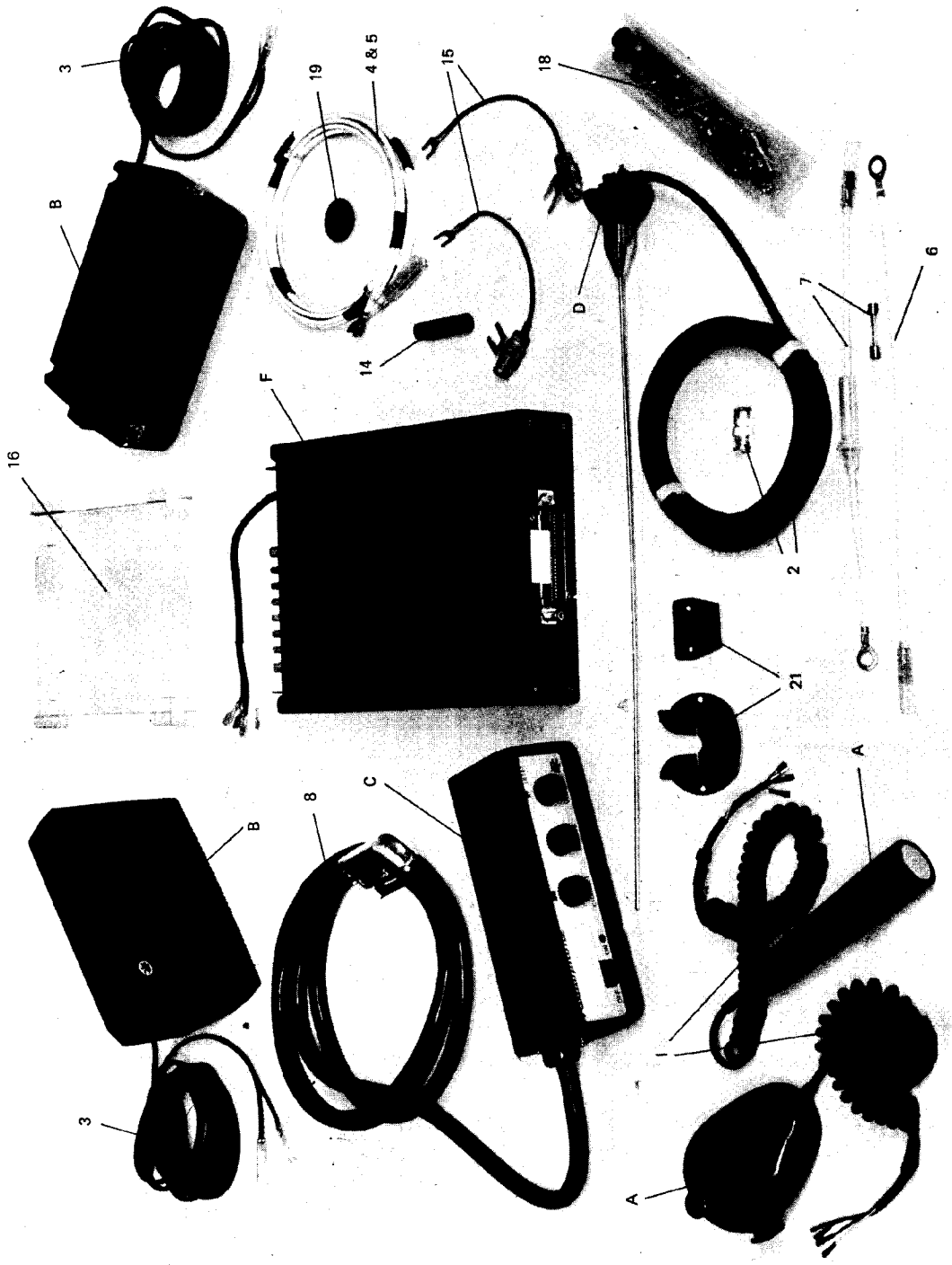


Figure S2.2 Extended Control Installation Kit

Figure S2.1 Local Control Installation Kit

SECTION 3 - ALIGNMENT

3.1 GENERAL

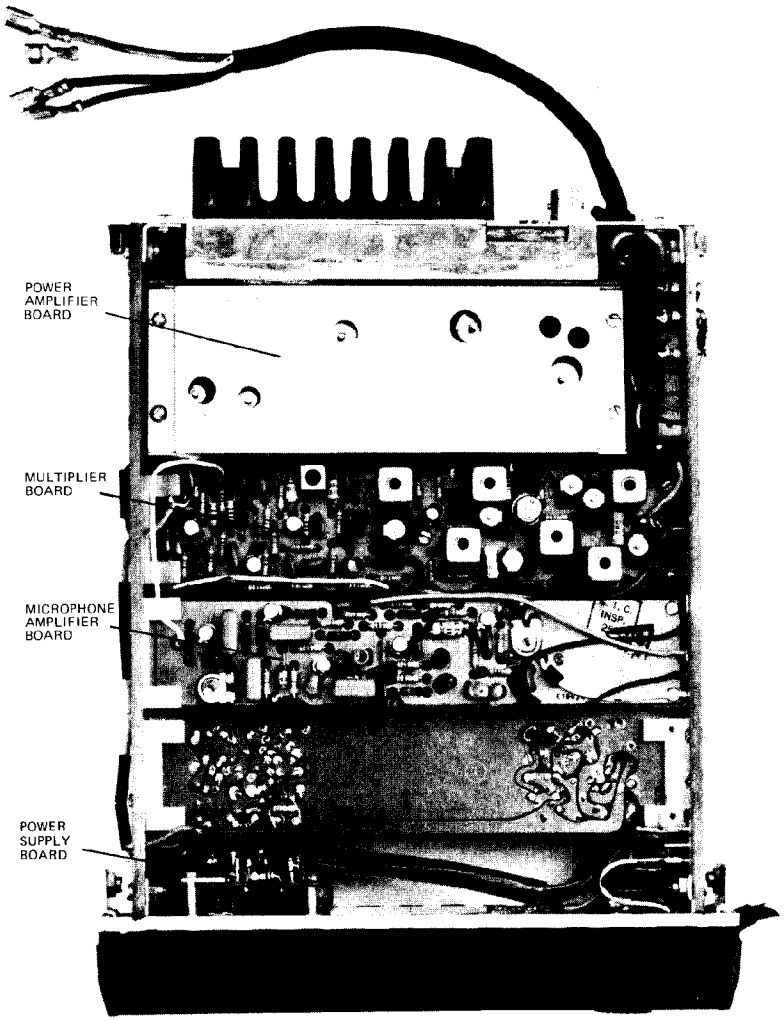
This section describes the alignment for a fully operational mobile unit.

Access is by withdrawing the unit from the outer case which may be achieved by removing the two 4BA screws at the outer edges of the rear panel and the two 6BA screws at the forward edge of the side panels. Printed-circuit boards need not be removed for any of the testing or alignment described in this section.

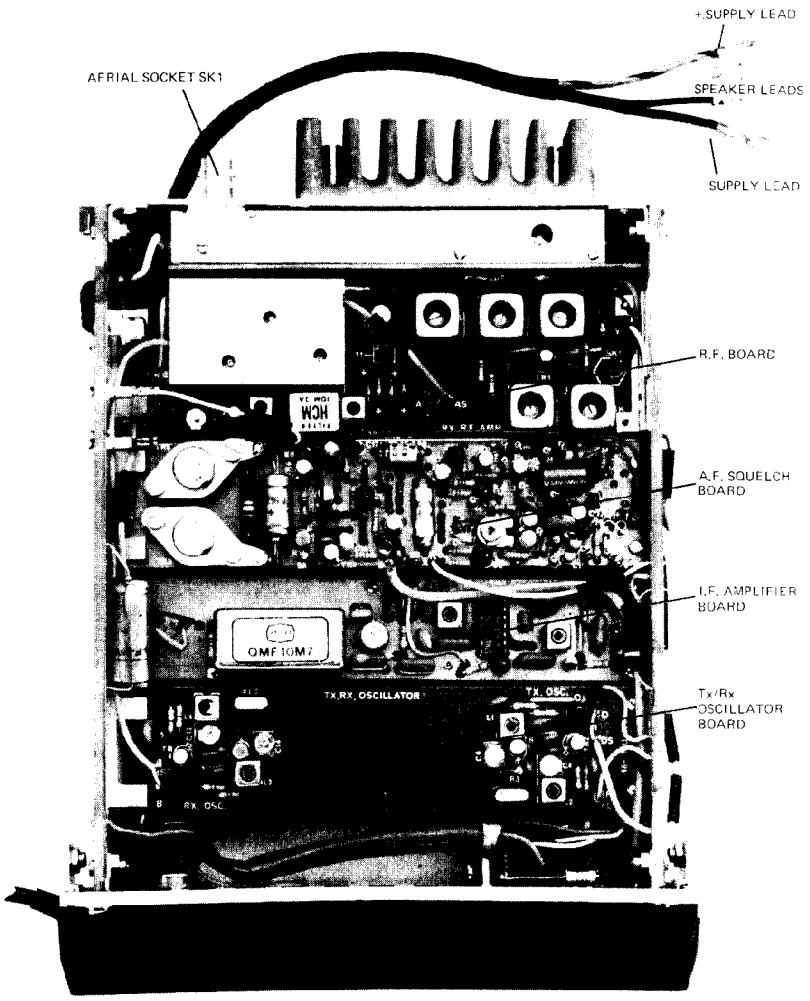
3.2 TEST EQUIPMENT

The following list includes recommended types of test instruments for the overall alignment and fault location. It is a list of equipment used in obtaining the data included in this manual. Where the specified test equipment is not available, equivalent types may be used provided that due corrections are made for differences in characteristics.

1)	12 to 15V, 2.5A or 5A (as required) variable current limited power supply	HP6427B
2)	A.F. Signal Generator	AWA G231
3)	R.F. Signal Generator	Marconi Instruments TF995a/5
4)	R.F. Power Meter	Bird Watt meter Model 67
5)	R.F. Voltmeter	Booton Electronics 91DA (with 50 ohm termination)
6)	A.F. Power Meter	Marconi Instruments TF893A (incorporating 3 ohm, 10 watt load)
7)	A.F. Noise and Distortion Meter	HP333A O
8)	R.F. Modulation Monitor	Marconi Instruments TF2300
9)	Frequency Counter	HP5245L
10)	Oscilloscope	Telequipment Serviscope 532A



(a) Transmitter



(b) Receiver

FIGURE S3.1 TYPICAL VHF MOBILE RADIOTELEPHONE

c) Connect the RF signal generator (tuned to the correct frequency, use the centre frequency for multi-channel equipment) with an output level of 100mV p.d. and with 3.5KHz deviation at 1KHz. Set the preset MUTING control fully anti-clockwise and the variable MUTING control fully clockwise and the VOLUME control to mid-position.

d) For Low-Band Units.

Adjust in the order given, C13, C8, C6, C2, C1, C27, T2 and T3, on the RF board for maximum SINAD ratio. Reducing the generator output as required.

e) For High-Band Units.

Adjust in the order given C13, C8, C6, C2, C1, C7, T2, T3, C10 on the RF board for maximum SINAD ratio. Reducing the generator output as required.

f) Adjust L1 on the IF board for maximum AF output. Adjust T1 on the IF board and readjust C10 (high band units) and C13 on the RF board for maximum SINAD, without loss of sensitivity, with a generator level of 0.5uV.

g) Repeat the alignment (d) and (e). Typical performance figures being:

SINAD	12db	Input 0.35uV p.d. 3.5KHz deviation at 1 KHz.
Quieting	20db	Input 0.5uV p.d.
Signal to Noise	32db	Input 1uV p.d. 5 KHz deviation at 1 KHz

3.4.3 A.F. Output

a) Connect the Noise and Distortion meter, the oscilloscope and the AF watt meter (set to 3 ohm) to the loudspeaker output terminals.

Connect the RF generator, having an output level of 1mV (say) and 5 KHz deviation at 1 KHz.

b) With the VOLUME control fully clockwise adjust the pre-set control R4 for maximum AF output prior to limiting. This level should be equivalent to 3V r.m.s. or 3 watts (3 ohm load) with 5% or less distortion. (Note that the d.c. resistance of the interconnecting leads can effect the indicated output level).

allowance for the appropriate changes in circuit component reference numbers.

d) Refer to Section 3.5.4 for the final oscillator frequency adjustments.

3.5.2 Multiplier Adjustment

a) On multi-channel equipment select the centre-frequency channel.

b) Low band units (68 to 88 MHz):

Adjust in order C17, C26, L6 (if applicable), C30, C34 and C37 by peaking each control for maximum voltages as measured on either the collector or output of the following stage. Note that L6 may have a tuning slug for frequencies below 70 MHz (approx.).

It is important to tune the power amplifier stages, particularly the output stage, once drive is applied to these sections.

Repeat tuning if necessary, noting that the effective tuning of C17 can only be achieved by monitoring the collector voltage of TR6.

c) High band units (144 to 174 MHz):

Adjust in order L2, C17, C22, C25, C29, C32 and C36 by peaking each control for maximum voltage as measured on either the collector or output of the following stage. Note that L2 may have a ferrite tuning slug for frequencies below 160 MHz (approx.) and a non-ferrous slug for frequencies above 160MHz.

It is important to tune the power amplifier stages, particularly the output stage once drive is applied to these sections. Repeat tuning if necessary.

3.5.3 Power Amplifier Adjustment

a) On multi-channel equipment select the centre-frequency channel.

b) Adjust the associated tuning controls, for maximum indication on the RF power meter, in the order as follows:-

c) Adjust the modulation monitor to the required transmitter frequency and set the AF generator to 1 KHz (zero output), set R1 (MIC SENS) and R23 (DEV ADJ) on the microphone board fully clockwise.

d) Increase the AF level until the demodulated AF waveform, observed either on the meter or on a CRO, no longer increases linearly with increase in generator output i.e. limiting occurs. Increase the level by a further 20db.

e) Adjust R23 (DEV ADJ) for a maximum deviation of 5KHz for 25KHz channel spacing.

f) Check that the amplifier input AF sensitivity for 3.5KHz deviation is 1mV or less.

g) Set R1 (MIC SENS) to 2/3 clockwise rotation. Reconnect the microphone and check it's operation while speaking close to the microphone.

3.5.6 Aerial Switch Adjustment

Applicable to High-Band Units only.

Connect the RF voltmeter across the receiver input terminals, SK1, and adjust capacitor C28 for minimum reading (less than 0.5 volts) while operating the transmitter.

10 watt Low Band (66 to 88MHz) C2, C8, C9 and C10
25 watt Low Band (66 to 88MHz) C1, C5, C9, C22 and C24

10 watt High Band (144 to 174MHz) C1, C6, C10 and C9
25 watt High Band (144 to 174MHz) C5, C10, C14, C18 and C19

The nominal output power should be 10 watt or 25 watt as applicable for 13.8V battery supply.

It is important to tune all stages of the power amplifier board quickly, particularly the output stage, once drive is applied to these sections.

c) Repeat fine tuning, including the multiplier board, if required.

Note that the output power of the 25 watt units shall slowly decrease with time, at a rate dependent on ambient temperature and unit ventilation, due to the operation of the temperature control circuitry.

3.5.4 Transmitter Frequency Adjustment

a) Obtain a sample of the transmitter RF output and couple this signal into the frequency counter. This may be achieved for example by connecting the output directly to the counter via a suitable 30-40db attenuator.

b) On single channel units adjust C4 (course adjustment) and L2 (fine adjustment) until the frequency is at nominal.

c) No multi-channel equipment repeat the crystal adjustments for each individual channel crystal in turn.

3.5.5 Transmitter Modulation

a) Obtain a sample of the transmitter RF output and feed this signal into the modulation meter. E.g. connect the meter directly to the transmitter output via a 30-40db attenuator.

b) Disconnect the microphone (red and blue leads) at the 'Faston' connectors on the transmitter side board and connect the AF signal generator in it's place, via a 30K ohm series/300 ohm shunt pad.

c) Reset the VOLUME control to mid position.

3.4.4 Mute Threshold

a) Connect a loudspeaker to the AF output terminals. Connect the RF generator having the output set to the level at which it is desired for the muting circuit to operate e.g. 0.35uV p.d. and 3.5KHz deviation at 1KHz (say).

b) Turn the VOLUME control to a suitable listening level. Adjust the MUTING control in either an anti-clockwise or clockwise direction (as applicable) until the AF and noise signal is muted. Readjust the MUTING control in the reverse direction until the muting opens and signal is heard.

c) Reduce the RF generator level, slowly, until the muting closes and note that this level is approx. 2dB below the mute opening level.

3.5 TRANSMITTER ALIGNMENT

This section describes the alignment for a fully operational mobile unit. For a more detailed testing procedure of individual boards refer to Section 4 and Section 5.

3.5.1 Oscillator Adjustment

a) On single channel equipment set C6 and C4 to mid-value capacitance. Set the slotted end of the slug in L2 approximately 6 turns into the coil former.

b) Connect the RF voltmeter across the oscillator output, terminals D and DS, and adjust C6 for maximum output, approximately 0.5V.

c) On multi-channel equipment align each group of four channel oscillators on the centre frequency channel applicable to that group. The following multiplier and power amplifier stages however, are to be aligned on the centre frequency channel of the combined group of channels in actual operation.

Set all capacitors to mid-value and the slotted end of the slugs in each coil to approximately 6 turns into the coil former.

Repeat the adjustments for each individual oscillator in turn using the above mentioned procedure with

3.4.1 Oscillator Adjustment

a) On single-channel equipment set C14 and C12 to mid-value capacitance. Set the slotted end of the slug in L4 approximately 6 turns into the coil former.

b) Connect the RF voltmeter across the oscillator output terminals, B and BS, and adjust C14 for maximum output, approximately 0.4V.

c) Transfer the voltmeter to the oscillator multiplier output, terminals A and AS, adjust C3, C4, and C7 (mounted on the RF board) for maximum output. Approximately 1 volt.

d) Connect the frequency counter across the multiplier output, terminals A and AS, and check that the frequency is near the desired nominal frequency i.e. Carrier frequency minus 10.7 MHz. Adjust C12 (coarse adjustment) and L4 (fine adjustment) until the frequency is at nominal.

Recheck the multiplier output voltage.

e) On multi-channel equipment align each group of four channel oscillators on the centre frequency channel applicable to that group. The associated multiplier stages however, are to be aligned on the centre frequency channel of the combined group of channels in actual operation.

Set all capacitors to mid-value and the slotted end of the slugs in each coil to approximately 6 turns into the coil former.

Repeat the oscillator and crystal adjustments for each individual oscillator and associated crystal compensating components in turn using the above mentioned procedure with allowance for the appropriate changes in circuit component reference numbers.

3.4.2 Receiver Sensitivity

a) Connect the RF voltmeter to the multiplier output, terminals A and AS, and check that the output level is approximately 1V.

b) Connect the Noise and Distortion Meter and the oscilloscope across the loudspeaker output terminals.

11) Impedance Matching Network

12)	Multimeter, 20,000 ohms/volt	AVO Model 8 or 9
13)	Contact Thermometer	Gossen
14)	A.F. Voltmeter	Advance Millivolt meter 77B
15)	High Impedance Multi-meter	AWA Voltohmyst 1A56074
16)	Crystal Voltmeter	Siemens 'HF-Multizet'
17)	Trimming Tools	

3.3 PRECAUTIONARY MEASURES

3.3.1 Aerial Loading

The equipment has been designed to operate safely under a wide range of aerial loading conditions. However, it is strongly recommended that the transmitter should not be operated in the absence of a suitable load. Failure to observe this warning may result in damage to the transmitter power amplifier stage.

3.3.2 Power Supplies

The use of a current limited power supply is recommended. The equipment should be initially switched on in the receive condition with the current limit set to less than 1 amp. When transmitting the current limit should be set to 2.5 amp or 5 amp as required (10 watt or 25 watt respectively).

Should a non-limited power supply, with a high current capability, be used, a suitable 3 amp or 6 amp fuse must be connected in series with the supply lead.

3.4 RECEIVER ALIGNMENT

This section describes the alignment for a fully operational mobile unit. For a more detailed testing procedure of individual boards refer to Section 4 and Section 5.

Ensure that the transmitter may not be operated while testing the receiver section by removing the P.T.T. leads.

SECTION 4 - GENERAL SERVICE AND FAULT FINDING INFORMATION

4.1 GENERAL

The MTR-191 Mobile Radiotelephone has been designed to achieve a long operating life combined with a high standard of reliability. The equipment is contained within an enclosed case and no routine maintenance is necessary.

However should difficulty in obtaining or maintaining communication arise the fault finding and service techniques as suggested in this section should be followed.

Before assuming that the mobile unit is faulty, check that the unit is switched on and that the external supply is connected (lamp indication is sufficient), also check that the aerial connection is correct by either employing a VSWR meter or by a resistance continuity check between the whip and the centre conductor and a high resistance reading between the centre conductor and the cable braid.

4.2 TEST EQUIPMENT

Refer to Section 3.2 for a tabulated list of the suggested test equipment.

4.3 PRECAUTIONS

4.3.1 Aerial Loading

The equipment has been designed to operate safely under a wide range of aerial loading conditions. However, it is strongly recommended that the transmitter should not be operated in the absence of a suitable load. Failure to observe this warning may result in damage to the transmitter power amplifier stage.

4.3.2 Power Supply

The use of a current limited power supply is recommended. The equipment should be initially switched on in the receive condition with the current limit set to less than 1 amp. When transmitting the current limit should be set to 2.5 amp or 5 amp as required (10 watt or 25 watt respectively).

Should a non-limited power supply, with a high current capability be used, a suitable 3 amp or 5 amp fuse must be connected in series with the supply lead.

6) Transfer the voltmeter to the output of RF board, terminals C and CS. The output level should be 40-50 mV for an input RF signal to 1mV. If the signal is present the fault is in the IF board.

7) Transfer the RF voltmeter to the receiver aerial input and compare the level to that of the generator. A reduction of less than 0.5db indicates that the aerial switching circuitry is satisfactory.

Note:- This measurement must be done with the receiver oscillator inoperative e.g. removing the crystal.

After a fault has been isolated to a particular board, reference should be made to Board Replacement, Section 5.3 and to the appropriate detailed fault location data contained in Section 5.

4.5 TRANSMITTER FAULT FINDING

If the fault is in the transmitter section the following procedure should be adopted.

1) Connect a suitable power meter to the aerial socket. As an added precuation reduce the power supply voltage to 10 volts. Switch on and note the indicated power, typical level being 3 watts or 8 watts as applicable i.e. 10 watt or 25 watt unit respectively.

IF CORRECT

2) Increase the supply voltage to 13.8V and check that the output power is approximately 10 watts or 25 watts as applicable. Monitor the output frequency.

IF CORRECT

3) Check the modulation level of the carrier using a Modulation Meter, by speaking into the microphone. In the absence of modulation the fault is within the microphone and associated amplifier or the phase modulator.

LOW POWER INDICATED

4) Re-align the transmitter. Refer to Section 3.5.

LOW POWER INDICATED

5) Note the power supply current, should it be near nominal i.e. 2 amps or 4 amps respectively the power stages are

being driven and the fault may be in the antenna switching circuit.

Check that the antenna switch voltage is approximately zero. If not the fault is in the power supply and the "Transmit" diodes are not fully conducting.

LOW DC CURRENT INDICATED

6) Check the "transmit" +9V supply, acceptable limits being 8.4 to 9.6V.

LOW POWER INDICATED

7) Connect the RF voltmeter across the oscillator output terminals D and DS and check that the output is greater than 0.5V. If no output or low output is recorded the fault is within the oscillator board.

IF OUTPUT RECORDED

8) Transfer the voltmeter to the Multiplier output terminals L and LS. The output should be approx. 3 volts. If no output is recorded the fault is within the Multiplier Board.

After a fault has been isolated to a particular board reference should be made to Board Replacement, Section 5.3 and to the detailed fault location data contained in the appropriate Section 5.

4.4 RECEIVER FAULT FINDING

If the fault is in the receiver section the following procedure should be adopted. As a precaution, remove the microphone P.T.T. leads (black and white) to ensure that the transmitter cannot be activated.

1) Check the 13.8V and 9V d.c. supplies. If incorrect the fault is within the power supply circuit.

IF CORRECT

2) Set the VHF signal generator to the required channel frequency (using the frequency counter). Adjust the deviation to 5KHz and set the output level to 100mV. Connect the generator to the input socket and set the preset MUTING control fully anti-clockwise or the variable MUTING control fully clockwise and the VOLUME control to mid position.

   Connect the oscilloscope across the loudspeaker terminals. If a signal output is registered reduce the input RF level to 1uV and should the output remain then the fault is either in the aerial or loudspeaker.

IF NO OUTPUT

3) Transfer the oscilloscope to the input of the AF and Squelch board. An AF signal together with noise (at low RF levels) should be displayed. If signal is present the fault is in the AF and Squelch board.

IF NOT PRESENT

4) Check that the oscillator is functioning by connecting the RF Voltmeter across the oscillator output terminals B and BS. The level should be greater than 0.5V. If no output is registered the fault is in the oscillator circuit. Eliminate possible crystal failure by using another crystal.

IF SIGNAL PRESENT

5) Transfer the voltmeter to the output of the oscillator multiplier terminals A and AS. The level should be greater than 0.5V (in general close to 1V).

IF SIGNAL PRESENT

SECTION 5 - DETAILED SERVICE INFORMATION

5.1 GENERAL

Having localised a fault to a particular board or sub-assembly, reference should be made to the more detailed information and data, relating to the board in question, in the following sub-sections.

Unless otherwise stated, it is assumed that when servicing a fault on a particular board, associated boards are functioning correctly. The simplest form of a test jig and a means of obtaining necessary secondary generators etc. is a mobile unit itself. The testing of a board therefore is essentially testing the mobile unit as a whole. The information presented in the following sub-sections is based upon this assumption although data is provided to enable boards to be checked individually.

5.2 PRECAUTIONS

5.2.1 Aerial Loading

The equipment has been designed to operate safely under a wide range of aerial loading conditions. However, it is strongly recommended that the transmitter should not be operated in the absence of a suitable load. Failure to observe this warning may result in damage to the transmitter power amplifier stage.

5.2.2 Power Supply

The use of a current limited power supply is recommended. The equipment should be initially switched on in the receive condition with the current limit set to less than 1 amp. When transmitting the current limit should be set to 2.5 amp or 5 amp as required (10 watt or 25 watt respectively).

Should a non-limited power supply, with a high current capability, be used, a suitable 3 amp or 5 amp fuse must be connected in series with the supply lead.

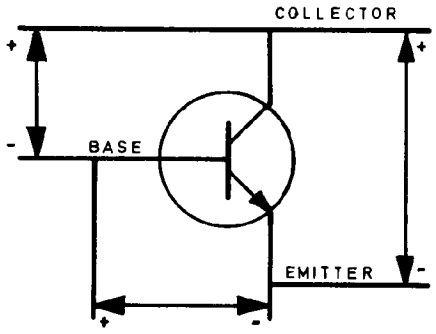
5.2.3 Soldering

Soldering operations should be kept to a minimum. Ensure that the equipment is switched off before soldering. Printed-circuit tracks should be clean before applying solder or the soldering iron. The amount of solder applied and the dwell time of the soldering iron should

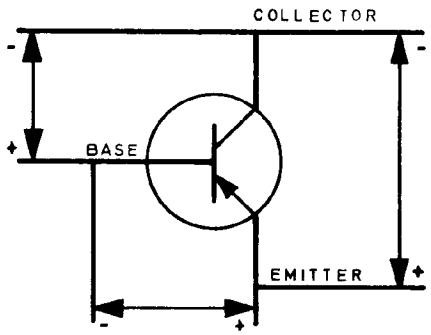
5.2.7 Transistor Replacement

If a transistor is suspected of defective operation an indication of it's performance can be assessed by measuring the forward and reverse resistances of the junctions. Unless the device is completely unsoldered ensure that the transistor is not shunted by some circuit resistance. An Avometer Model 8 on the nominal OHM range or similar multimeter should be used for the measurements.

It should be remembered that the actual polarity of the '+' terminal on an Avometer when set to OHMS is negative and the '-' terminal is positive. The diagrams below indicate the polarities required to measure the forward resistance of both n-p-n and p-n-p devices. This should be in the order of approximately 100 ohm. To measure the reverse resistances the leads should be reversed. The reverse resistances should be in the order of at least 100K ohm.



NPN Transistor



PNP Transistor

5.2.8 Interconnector Lead Lengths

The mobile unit specification relating to both RF and AF power outputs and receive sensitivity are applicable only when measurements are taken at the particular unit terminals. It is therefore essential to employ connecting leads of negligible or known loss i.e. heavy power supply leads, heavy speaker leads and minimum length of low-loss RF lead.

It must also be noted that at extremely low level receiver measurements, it is possible that greater receiver pick-up may be achieved from direct generator and lead radiation than that received via the interconnecting cable. This effect is quite dependent on the shielding of the particular generator being used.

Disconnect the receiver oscillator output from terminals B and BS (if necessary).

Disconnect the orange '+9V' lead, the yellow '+9V' lead and the black 'earth' lead.

Remove the two end screws and withdraw the board.

5.4.5 Transmitter/Receiver Four Channel Oscillator Board

Proceed as in 5.4.4 above but in addition, if necessary, disconnect the brown, red, orange and yellow channel-selecting leads.

5.4.6 Receiver Eight and Twelve Channel Oscillator Board

Disconnect the oscillator output from terminals O/P and S (if necessary).

Disconnect the yellow '+9V' lead and the black 'earth' lead.

Remove the transmitter board support screw at the extreme left hand side.

Remove the two end screws and withdraw the board with the channel selecting leads intact.

5.4.7 Transmitter Eight and Twelve Channel Oscillator Board

Disconnect the oscillator output from terminals O/P and S (if necessary).

Disconnect the yellow '+9V' lead and the black 'earth' lead. Remove the support screw at the extreme right hand side.

Remove the two end screws and withdraw the board with the channel selecting leads intact.

5.4.8 Transmitter Multiplier Board

Disconnect the oscillator input from terminals D and DS.

Disconnect the multiplier output from terminals L and LS.

Disconnect the red '+12V' lead, the orange '+9V' lead, the black 'earth' lead and the white 'modulator' lead from the A.F. panel.

Remove the two end screws and withdraw the board.

The driver transistor (TO5 case) may be removed by first unscrewing two 6BA screws and removing the mounting adaptor plate.

Re-locate this plate before soldering a replacement transistor in position.

5.4.12 Power Supply Board

Maintenance of the power supply board may be achieved by either removing the three retaining screws and swinging the board to obtain access or removing a screw from both side panels and pivoting the front panel down for access.

5.4.13 Indicator Lamp Replacement

The 'power on' indicator lamp and the 'TX on' lamp are light-emitting diodes (LEDs) and therefore correct voltage polarity must be maintained.

Remove the facia knobs.

Unsolder the diode leads.

Remove the facia panel, seven 6BA screws. It may be easier to first remove two side panel screws and pivot the front assembly down as a complete unit.

The lamps are held in position by reflowing a small portion of the plastic surround.

The 'channel lamp' (if applicable) is a standard incandescent lamp mounted off the channel selector switch.

5.5 RECEIVER R.F. AMPLIFIER BOARD - LOW BAND AND HIGH BAND

5.5.1 References

Low-Band

Circuit Diagram Number	Figure 5
Manufacturing Code	DP351601 (28-LMU-5B)
includes Multiplier	DP351600 (270-LMU-2B)

High-Band

Circuit Diagram Number	Figure 6
Manufacturing Code	DP351150 (28-LMU-5A)
includes Multiplier	DP351170 (270-LMU-2A)

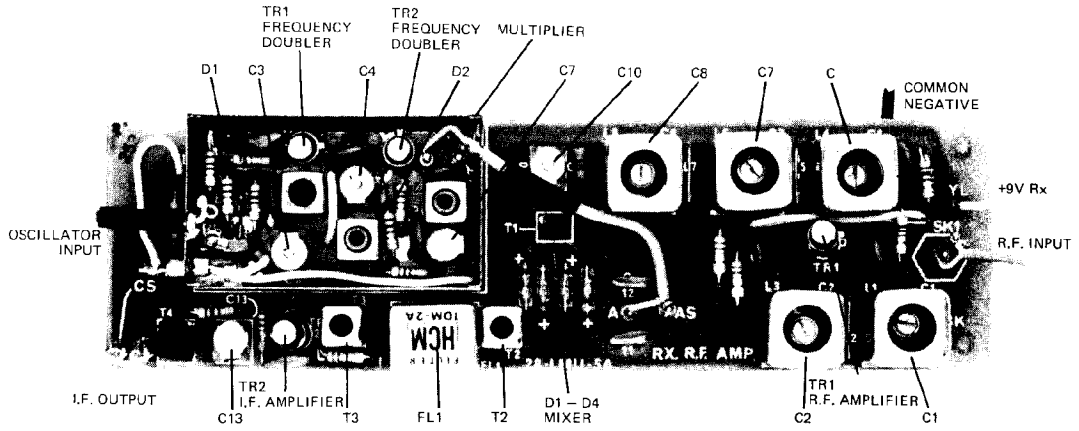


Figure S5.2

Receiver R.F. Board, High Band

5.5.3 Circuit Description

The receiver R.F. board accepts an input signal via the aerial switch in the range 68 to 88 MHz or 144 to 174 MHz (as applicable), and produces an intermediate frequency signal of 10.7 MHz.

Narrow-band selectivity in the R.F. amplifier TR1 (employing a field effect transistor) is achieved by five separately tuned circuits. This signal and the oscillator/multiplier output signal are coupled to a balanced diode mixer to produce the 10.7 MHz signal. A crystal 50KHz blocking filter FL1 (one of two filters used for I.F. selectivity, the second is on the I.F. board) is followed by an I.F. amplifier TR2, also a field effect transistor.

The mixing signal is obtained from the oscillator multiplier amplifier contained in a separate can mounted on the RF board. This circuit consists of a doubler and amplifier stages for low-band or two doubling stages for high-band.

The A (high-band) and B (low-band) versions of the RF board are similar but with minor component changes. In the low-band version the tuning capacitor C10 is omitted

5.6 RECEIVER I.F. BOARD

5.6.1 References

Circuit Diagram Number	Figure 7
Manufacturing Code	DP351140, (28-LMU-6A)

5.6.2 Performance

Input frequency	10.7 MHz
Output frequency	Audio frequency
Input sensitivity	10uV minimum
output level	150mV r.m.s.

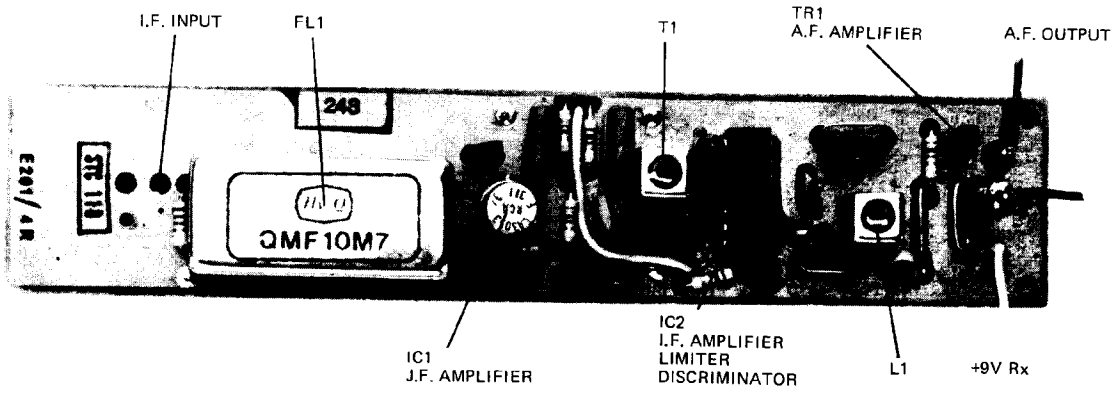


Figure S5.3

Receiver I.F. Board

5.6.3 Circuit Description

Adjacent channel selectivity is achieved by the crystal filter FL1. The input 10.7 MHz I.F. signal is amplified by the integrated circuit amplifier IC1 and transformer coupled to the integrated circuit IC2 which contains a multi-stage amplifier, limiter and a balanced-quadrature demodulator. Inductor L1 provides a centre frequency

Circuit Reference	Function	Pin No.	V d.c.
IC2	Limiter and Phase Discriminator	1	2.8
		2	3.4
		3	2.8
		4	1.4
		5	1.4
		6	1.4
		7	0
		8	0
		9	0.2
		10	1.4
		11	2.8
		12	3.4
		13	7.7
		14	3.5

Circuit Reference	Function	Emitter	Base	Collector
TR1	AF Amplifier	3.5	2.8	0.9
+9V Rx Supply		8.8V		

5.7 RECEIVER A.F. AND SQUELCH BOARD

5.7.1 References

Circuit Diagram Number	Figure 8
Manufacturing Code	DP351160

5.7.2 Performance

Input Level	50mV minimum
Output Level	3 watts into 3 ohm load
Distortion	less than 5%
Muting	variable up to luV p.d.

5.7.3 Circuit Description

When a received carrier signal is present, the detected audio and noise is passed through a Miller integrator de-emphasis network TR1, an amplifier TR2 and an active low-pass filter TR3 and then coupled to the volume control. The signal as determined by the setting of the volume control is coupled to a power amplifier comprising TR4 to TR9 inclusive.

The switching action of TR11 is thus determined by the noise content of the A.F. signal and also by the positive base bias governed by the setting of the MUTING control. The range of muting is from 0.25uV p.d. to 1uV p.d.

Resistors R43 and R45 provide an isolated output voltage governed by the operation of the D.C. switch transistor TR11. This power squelch output is used in base station applications.

5.7.4 Adjustment

Connect the R.F. Generator to the aerial socket, the D and N Meter, oscilloscope and the A.F. Power Meter to the loudspeaker output.

a) Check that the +13.8V supply is present and that the +9V Rx supply is within the limits 8.4 to 9.6 volts.

b) Set the VOLUME control fully clockwise and the preset MUTING control fully anti-clockwise or the variable MUTING control fully clockwise (as applicable).

c) Set the generator to frequency with an output level of 10uV with a modulating frequency of 1KHz and a deviation of 5KHz.

d) Adjust the AUDIO GAIN control for maximum A.F. output prior to the advent of clipping.

The output power should be 3 watts into 3 ohms (3V r.m.s.) and having 5% or less distortion.

The level at the VOLUME control should be 600 to 700mV and the input level less than 50mV.

e) Set the VOLUME control to mid-position and reduce the generator deviation to 1KHz or an input A.F. level of 10mV. Vary the generator A.F. frequency and check that the overall frequency response is within the following limits.

Frequency KHz	Response in db
0.3	+11.5 to +3.5
1	0
3	-8.5 to -12.5
6	-30 or less

Ensure clipping does not occur as the frequency is reduced to 300Hz.

5.8 TRANSMITTER/RECEIVER OSCILLATOR BOARD SINGLE CHANNEL

5.8.1 References

Circuit Diagram Number	Figure 9
Manufacturing Code	DP351110 (16-LMU-1A)

5.8.2 Performance

Frequency	Transmitter	22.66 to 29.33 MHz
	Receiver	28.65 to 40.825 MHz
Frequency Stability		± 0.001% from -10°C to +60°C with reference to +24°C.
Crystal Specification		Plug in style to STC 1012
Output Power		50mW into 50 ohms

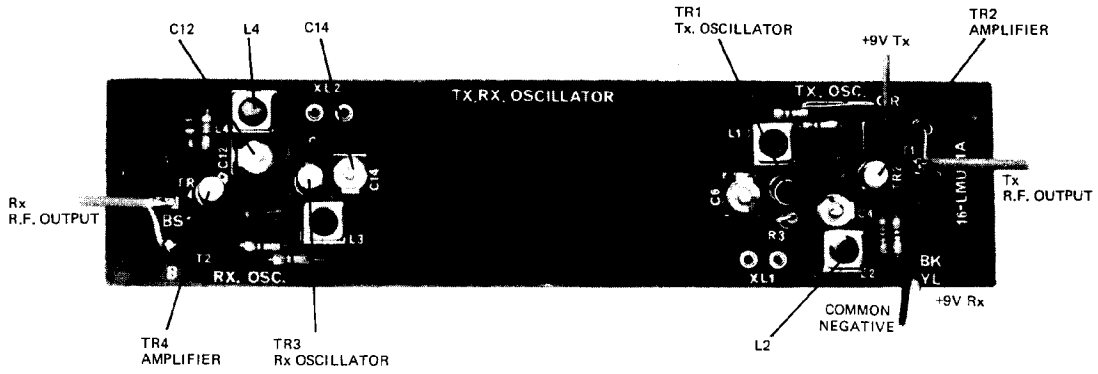


Figure S5.5

TX/RX Oscillator Board, Single Channel

5.8.3 Circuit Description

The single channel equipment employs two separate transmitter/receiver oscillators on the one board. The transmitter oscillator output signal is coupled to the

Transistor	Function	Voltage D.C. Emitter	Base	Collector
TR1	Tx Oscillator	3.7	4.3	8.6
TR2	Amplifier	1.8	2.5	8.6
TR3	Rx Oscillator	3.4	4.1	8.7
TR4	Amplifier	2.1	2.8	8.7
+9V Receive Supply			8.7V	
+9V Transmitter Supply			8.6V	

5.9 TRANSMITTER/RECEIVER OSCILLATOR BOARD (FOUR CHANNEL)

5.9.1 References

Circuit Diagram Number	Figure 10
Manufacturing Code	DP342187 (16-LMU-8A)

5.9.2 Performance

Crystal controlled oscillators

Frequency	Transmitter	22.66 to 29.23 MHz
	Receiver	28.65 to 40.825 MHz
Output Power		50mW into 50 ohms
Frequency Stability		$\pm$ 0.001% over $-10^{o}C$ to $+60^{o}C$ with reference to $+24^{o}C$
Channels		Four channels (switched)
Crystal Specification		Plug in style to STC 1012

are reverse biased thus achieving isolating of all crystals other than that selected.

The oscillator tuned collector output is coupled to the base of the appropriate buffer transistor TR1/TR4. The emitter of the TR1/TR4 is unby-passed and the collector transformer untuned to provide a broadband, high impedance buffer load to the oscillator circuit.

The +9V supply is connected to the transmitter oscillator (orange) when the P.T.T. switch is actuated, at all other times, the +9V supply is connected to the receiver oscillator (yellow). The supply switching is on the power supply board.

The only difference between transmitter and receiver oscillators is in the value of the biasing resistors associated with the buffer transistor TR1 and TR4. Refer to the circuit diagram table for values.

5.9.4 Alignment

Warning:

Ensure that the power amplifier (if connected) cannot operate unless correctly terminated.

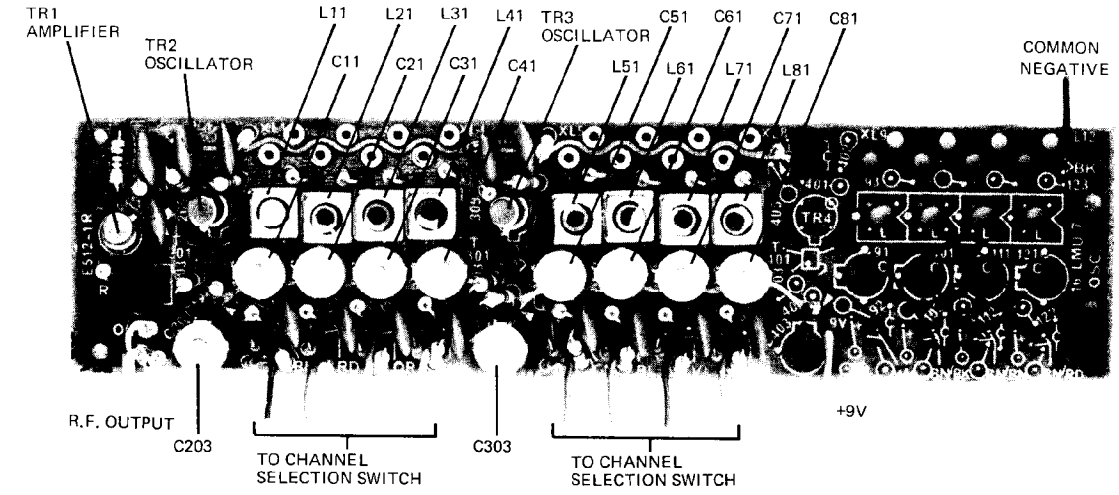
a) Set the crystal trimming capacitors C11, C21 etc. to mid-value and the slotted-end of the slug in L1, L21 etc. to approximately 6 turns into the coil former.

b) Connect the voltmeter and load (if necessary) across the oscillator output.

c) Select the mid-frequency channel and adjust the collector tuning capacitors C203/C303 for maximum output (approximately 0.5V). Operating the P.T.T. switch as applicable.

d) Connect the frequency counter to the output. Selecting each channel in turn adjust each crystal frequency-trimming components e.g. C11 (coarse) and L1 (fine), for the correct output frequency.

5.10.3 Circuit Description



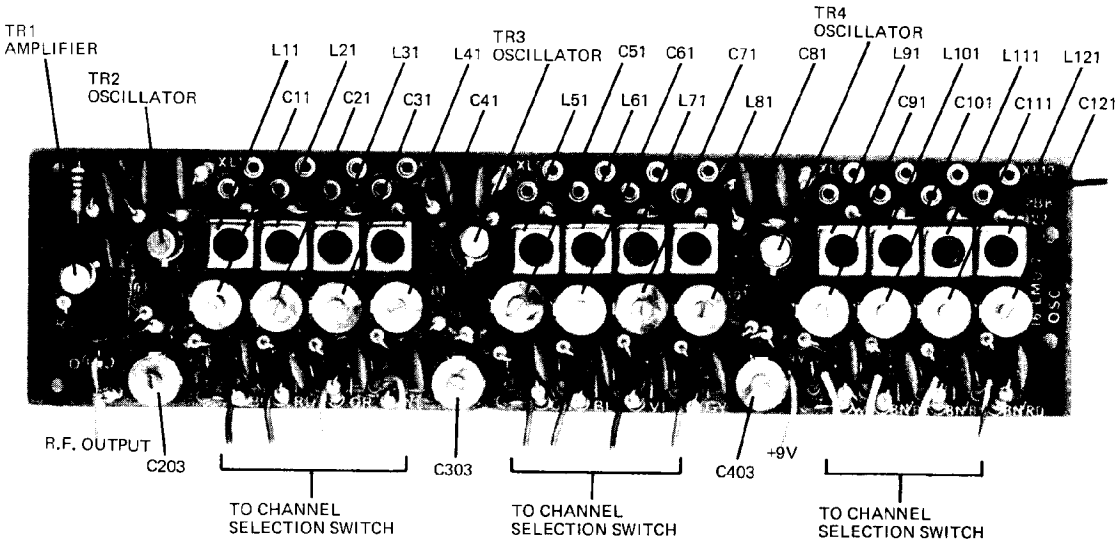


Figure S5.7 (a) and (b)

TX/RX Oscillator Board Eight and Twelve Channel

The eight and twelve channel equipment employs separate transmitter and receiver oscillator boards, each board contains oscillator and amplifier circuitry with provisions for switching of up to twelve crystals and associated frequency trimming components.

5.10.4 Alignment

Warning:

Ensure that the power amplifier (if connected) cannot be operated unless correctly terminated.

a) Set the crystal trimming capacitors C11, C21, etc. to mid-value and the slotted end of the slug in L1, L21, etc. approximately 6 turns into the coil former.

b) Connect the voltmeter and load (if necessary) across the oscillator output.

c) Selecting the respective mid-frequency channel for each oscillator group in turn adjust the collector tuning capacitors C203, C303 etc. for maximum output (approximately 0.5V) operating the P.T.T. switch as applicable.

d) Connect the frequency counter to the output. Selecting each channel in turn adjust each crystal frequency-trimming component e.g. C11 (coarse) and L1 (fine), for the correct output frequency.

5.10.5 Operating Parameters

Voltage Measurements

Transistor	Function	Voltage D.C. Emitter	Base	Collector
12 Channel Transmitter Oscillator				
TR1	Amplifier	1.3	2.0	9.0
TR2	Oscillator (on)	3.1	3.7	8.6
TR3	Oscillator (off)	4.0	4.4	9.0
TR4	Oscillator (off)	4.0	4.4	9.0
12 Channel Receiver Oscillator				
TR1	Amplifier	0.7	1.45	9.0
TR2	Oscillator (on)	3.1	3.7	8.6
TR3	Oscillator (off)	4.0	4.45	9.0
TR4	Oscillator (off)	4.0	4.45	9.0
8 Channel Transmitter Oscillator				
TR1	Amplifier	1.3	2.0	9.0
TR2	Oscillator (on)	3.2	3.8	8.6
TR3	Oscillator (off)	4.0	4.5	9.0

The microphone input is coupled via the preset MIC SENS control to the first amplifier stage TR1. The telephone input is used on base station equipment and therefore has no preset adjustment.

Pre-emphasis on the incoming signal at a 6db per octave slope, is provided by R4 and C4 (together with the low input impedance of IC1).

The integrated circuit IC1 provides further amplification and possible limiting of the pre-emphasised signal as a means of restricting the modulation deviation. Transistor TR2 biases IC1 to the centre of its operating characteristics so that clipping is symmetrical.

The network R14 and C9 provides the required de-emphasis characteristics followed by a high input impedance amplifier TR3. The audio bandwidth is restricted by the use of a low-pass four-pole active filter formed by the circuit comprising TR4 and TR5.

The required deviation is determined by the setting of the DEV ADJ control R23. Whereas the input sensitivity is determined by the setting of the MIC SENS control.

5.11.4 Adjustment

Connect the wattmeter and R.F. sampling probe to the unit R.F. output and couple the sampled signal to the FM Monitor input.

a) Remove the microphone leads (red and blue) and connect the A.F. generator output to the microphone input via the generator matching network (100:1 attenuation).

b) Set the MIC SENS (R1) and the DEV ADJ (R23) controls fully clockwise.

c) Check that the +9V Tx supply is within the limits 8.4 to 9.6 volts.

d) Amplifier gain check:

Set the generator output to 10mV at 1KHz and check that the amplifier output (white lead) is approximately 4mV. Increase the generator output to 100mV and check that the output voltage is approximately 50mV.

Adjust the MIC SENS control (R1) to approximately 60% clockwise rotation.

Reconnect the microphone and check it's operation while speaking close to the microphone.

5.11.5 Operating Parameters

Voltage measurements

Transistor	Function	Voltage D.C. Emitter	Base	Collector
TR1	Amplifier	1.9	2.6	5.0
TR2	D.C. Control	3.2	2.6	0.6
TR3	Amplifier	2.7	3.3	6.4
TR4	Filter	5.4	6.1	8.6
TR5	Filter	4.7	5.4	8.6
IC1	Clipping Amplifier Pin 1		0.7V	
		2	5.8V	
		3	3.2V	
	+9V Transmitter Supply		8.6V	

5.12 TRANSMITTER MULTIPLIER BOARD

5.12.1 Reference

Circuit Diagram Number

Low-Band	Figure 13
High-Band	Figure 14

Manufacturing Code

Low-Band	DP351602 (270-LMU-1B)
High-Band	DP351040 (270-LMU-1A)

5.12.2 Performance

Input level	50mW into 50 ohms
Output level	
Low-Band	50mW into 50 ohms
High-Band	150mW into 50 ohms

The transmitter multiplier board produces a phase modulated R.F. signal suitable for injection into the power amplifier board.

The oscillator R.F. signal and the microphone amplifier A.F. signal are combined in a two stage (high-band) or three stage (low-band) phase modulator. The basic element of the phase modulators is a non-linear resistor obtained by the application of the A.F. signal across diodes D1, D2 and D3. The effective non-linear resistor characteristics off-sets the basic circuit non-linearities to produce a frequency deviation related linearily to the amplitude of the modulating A.F. signal.

The resulting phase modulator signal is amplified and frequency multiplied to achieve the necessary output signal. The multiplication being 3 times for low-band units and 6 times for high-band units.

Multiple interstage tuned circuits provides the necessary selectivity ensuring adequate rejection of unwanted frequencies. The output power is nominal 50mW for low-band units and 150mW for high-band units. The circuit function when the P.T.T. switch is actuated thereby applying the '+9V transmit' supply to the low level stages, at all other times the circuit remains in the quiescent off-state.

5.12.4 Alignment

Connect the watt meter and R.F. sampling probe to the unit R.F. output and couple the sampled signal to the F.M. monitor input.

a) Check that the 13.8V supply is connected and that the +9V Tx supply is within the limits 8.4 to 9.6 volts.

b) Connect a multi-meter set to Amps d.c. (or suitable ammeter) in either the unit supply lead or the 13.8V lead to the multiplier board.

c) On multi-channel equipment, select the centre channel.

d) Low-band units:

Adjust in order C17, C26, L6 (if applicable), C30, C34 and C37 by peaking each control for maximum voltage as measured on either the collector or output of the following stage.

Transistor	Function	Voltage D.C. Emitter	Base	Collector
Other levels	Junction R4/R2	7.3		
	Junction R11/R9	7.2		
	Junction R19/R17	7.4		
Input Supply		+13.8V		
+9V Transmitter Supply		8.7V		
Supply current (with R.F. drive)				
	+9V Tx Supply	50mA		
	+13.8V Supply	40mA		

Group A (high-band)

TR6	Modulator	1.3	2.0	5.8
TR1	Modulator	1.3	2.0	5.9
TR2	Amplifier	2.5	3.2	8.0
TR3	Tripler	0	0.6	13.8
TR4	Amplifier	2.2	2.9	11.8
TR5	Doubler	0	0	13.8

Other levels	Junction R29/R26	7.4
	Junction R2/R1	7.3
	Junction R11/R8	8.0
Input Supply		+13.8V
+9V Transmitter Supply		8.7V
Supply current (with R.F. drive)		
	+9V Tx Supply	.35mA
	+13.8V Supply	120mA

5.13 POWER AMPLIFIER (10W LOW-BAND)

5.13.1 Reference

Circuit Diagram Number	Figure 15
Manufacturing Code	DP351637 (28-LMU-14D)

5.13.2 Performance

Input Power	50mW
Output Power	10 watt
Frequency	68 to 88 MHz

The multiplier output (nominal 50mW) is coupled to the input of the two stage power amplifier comprising TR1 and TR2 to produce a nominal 10 watt output.

The output power being measured at the output port and includes the switch and low-pass filter insertion losses.

Transistor TR1 functions with a degree of forward biasing derived from the diode network D8. Discreet inductors are used in the collector tuning circuits whereas strip-line techniques are utilised for interstage coupling.

The output of the power amplifier is coupled to the aerial via a diode transmit/receive switch and a low-pass filter.

In the 'transmit' condition the '+9V Tx' supply is applied to the switch diodes D2/D5 and D3/D4 via the isolating diode D7. The return path is via D6 since the antenna switch is at ground potential. The diode combinations conduct such that D2/D5 forms a low impedance path for the transmitter signal to the aerial whereas the eighth-wave-length line X4 converts the low impedance path D3/D4 and C30 to an effective open-circuit across the output signal path thus isolating the transmitter output from the receiver input. Further attenuation of this signal is achieved as diode D1 is reverse biased.

In the 'receive' condition, the aerial switch voltage approaches +13.8V and the '+9V Tx' voltage is removed i.e. zero voltage. The diodes D2/D5 and D3/D4 are reversed biased where as the receiver series diode D1 is forward biased via R14 through to R13. The received signal is thus passed through the aerial filter to the receiver input, the low impedance power amplifier output being isolated by the reverse biased diodes D2/D5.

The low-pass aerial filter being common to the transmitter and receiver, attenuates the transmitter output harmonics to an acceptable level and provides a degree of wide-band selectivity for the receiver input. The filter components comprises the obvious L/C components combined with the line impedance created by the various diode networks transformed by the receiver line X4.

5.13.4 Alignment

a) Check that the +13.8V supply is present and that the +9V Tx supply is within the limits 8.4 to 9.6V.

5.14.3 Circuit Description

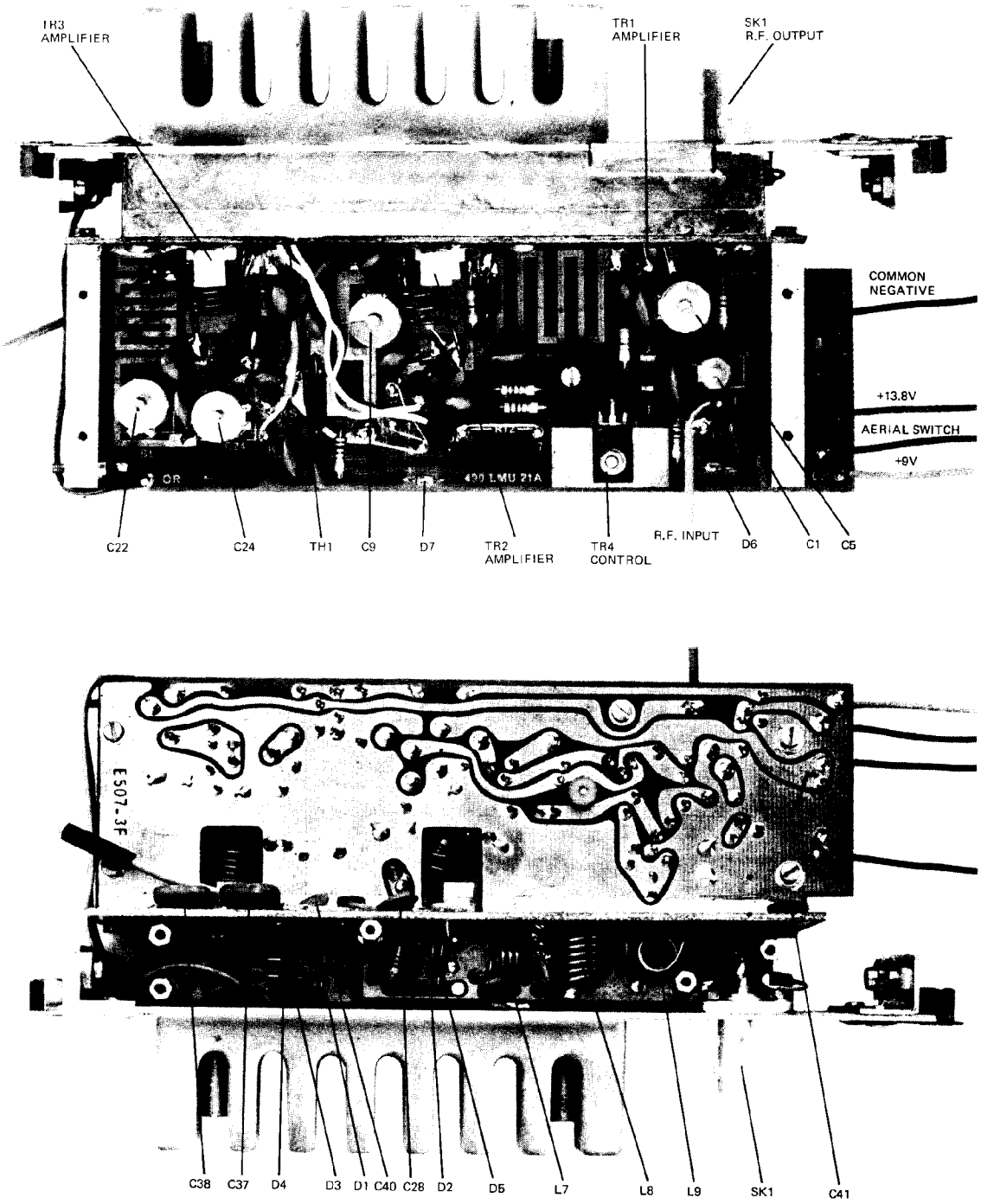


Figure S5.12

Power Amplifier, 25W, Low Band

In the 'receive' condition, the aerial switch voltage approaches +13.8V and the '+9V Tx' voltage is removed i.e. zero voltage. The diodes D2/D5 and D3/D4 are reversed biased whereas the receiver series diode D1 is forward biased via R14, through to R13. The received signal is thus passed through the aerial filter to the receiver input, the low impedance power amplifier output being isolated by the reverse biased diodes D2/D5.

The low-pass aerial filter being common to the transmitter and receiver, attenuates the transmitter output harmonics to an acceptable level and provides a degree of wide band selectivity for the receiver input. The filter components comprises the obvious L/C components combined with the line impedance created by the various diode network transformed by the receiver line X4.

5.14.4 Alignment

a) Check that the +13.8V supply is applied and that the +9V Tx supply is within the limits 8.4 to 9.6V.

b) Adjust the following controls in order to achieve maximum indicated output power C1, C5, C9, C22 and C24.

The output being a nominal 25 watts.

5.14.5 Operating Parameters

Typical operating parameters are listed below:

Transistor	Collector Current	
	No Drive	With Drive
TR1	12mA	14mA
TR2	0mA	850mA
RE3	0mA	2.8A

	Transmit	Receive
Junction L11/C34 voltage	6.0V	6.3V
Junction R9/R15 voltage	0.9V	7.8V
Aerial Switch voltage	0V	13.8V
Aerial Switch current	68mA	0
+9V Tx supply	8.8V	0
Thermistor TH1/R12 junction	1.2V at 20°C heatsink temperature	

5.15.3 Circuit Description

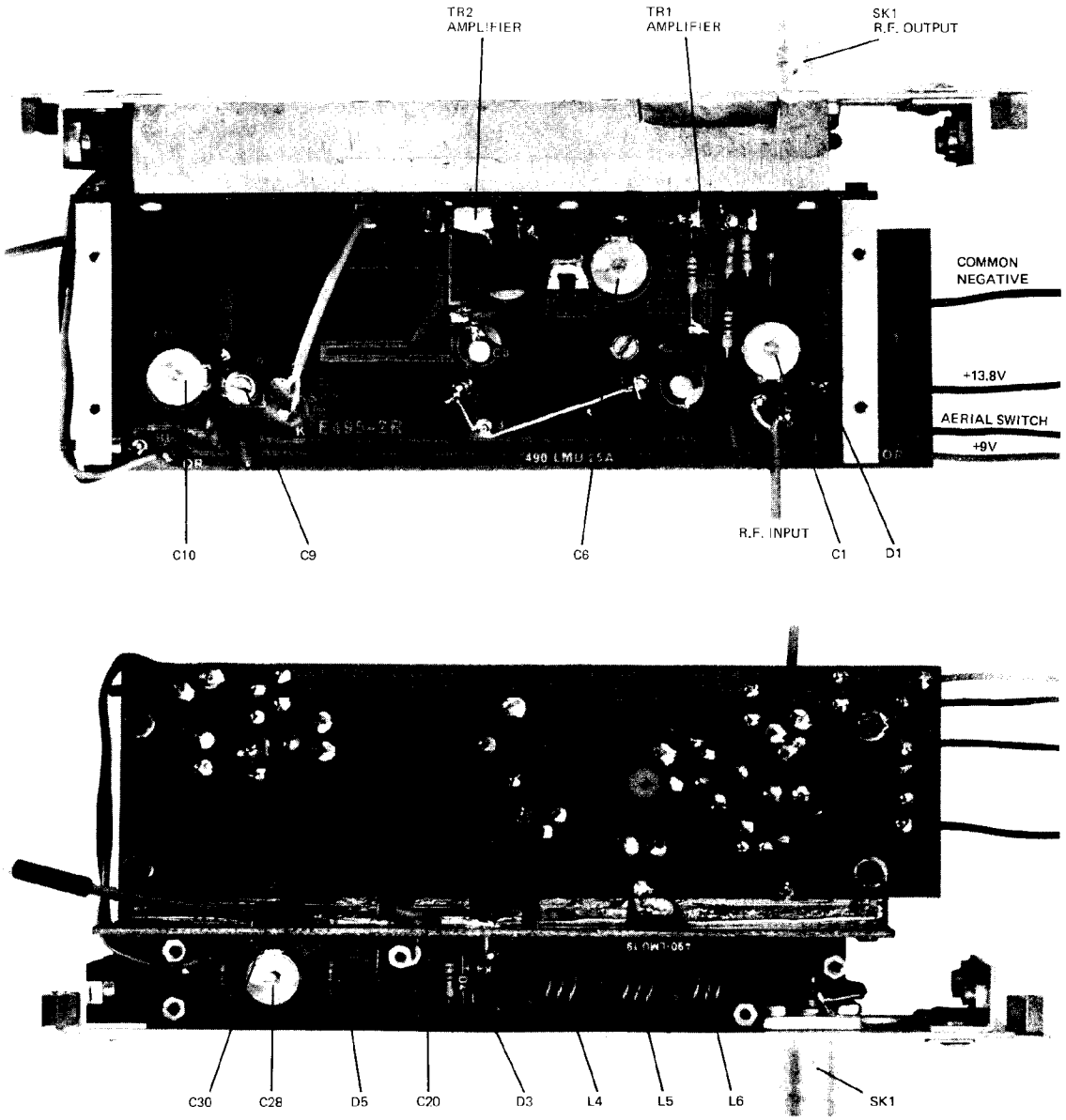


Figure S5.13

R.F. Power Amplifier 10W, High Band

The transmitter power amplifier comprises four separate printed circuit boards, the R.F. board, an intercoupling board, the aerial filter and the aerial switching circuit. The boards are contained within metal enclosures to form a complete module with the power transistor heatsink as part of the rear panel. Refer to Section 5.4.10 for the disassembly procedure.

b) Adjust the controls in the order given to produce maximum indicated output power, C1, C6, C10 and C9, the output power is a nominal 10 watts.

5.15.5 Operating Parameters

The list of typical operating parameters are listed below.

Transistor	Collector Current No Drive	With Drive
TR1	13mA	250mA
TR2	0mA	1.2A
TR1 base voltage (no drive)	0.35V	

	Transmit	Receive
+9V Tx supply	8.8V	0
Aerial Switch Supply	0V	13.8V
Aerial Switch Current	mA	0

Input R.F. voltage	approximately 2.6V r.m.s.
Input Power	150mW min (50 ohms)
Output Power	10 watts

5.16 TRANSMITTER OUTPUT BOARD 25 WATT HIGH-BAND

5.16.1 Reference

Circuit Diagram Number	Figure 18
Manufacturing Code	DP351030 (28-LMU-14A)

5.16.2 Performance

Input Power	150mW
Output Power	25W
Frequency	144 to 174 MHz

The transmitter power amplifier comprises four separate printed circuit boards, the R.F. board, an intercoupling board, the aerial filter and the aerial switching circuit. The boards are contained within metal enclosures to form a complete module with the power transistor heatsink as part of the rear panel. Refer to Section 5.4.10 for the disassembly procedure.

The multiplier output (nominal 150mW) is coupled to the input of the three stage power amplifier comprising TR1, TR2 and TR3 to produce a nominal 25 watt output.

The output power being measured at the output port and includes the aerial switch and low pass filter insertion losses.

Strip-line techniques are utilised for both interstage coupling and the collector tuning circuits.

The power amplifier includes provision for the control of the drive to the output stages by means of control of the collector supply to the first stage. The function of the control is to prevent excessive temperature rise in the transistor junctions should the mobile unit be operated in a continuous mode. A level of output power, dependent of the ambient temperature, will be established and will maintain the amplifier module heatsink at a temperature of a little in excess of 90^{o}C due to the device power dissipation. The control to the first stage is accomplished by means of a series supply transistor/thermistor combination TR4/TH1, such that an increase in heatsink temperature causes a decrease in thermistor resistance with a corresponding decrease in the collector supply, thus decreasing the effective drive to the final stages.

The output of the power amplifier is coupled to the aerial via a diode transmit/receive switch and a low pass filter.

In the 'transmit' condition the '+9V Tx' supply is applied to the switch diodes D3/D4. The return path is via L3 and the conducting antenna switch transistor TR6 (located on the Power Supply board). Diodes D3/D4 in a conducting state forms a low impedance path for the transmitter signal to the aerial whereas the quarter-wave line X8 converts the low impedance path of D5 and C27/C28 to an effective open circuit across the signal path thus isolating the transmitter output from the receiver input. Capacitor C28 is adjusted for resonance at the particular carrier frequency to achieve maximum isolation.

5.16.6 Control Circuit

1) With the amplifier functioning correctly, measure the heat sink temperature with a contact thermometer (ensuring good thermal contact by employing a suitable thermal conducting paste and placing the probe into the corner of rear panel and the finned casting.)

2) Allow the amplifier to run continuously and check that the heatsink temperature stabilises at an operating temperature of 90° to 95°C.

Should it be necessary to adjust the temperature control due to an associated component change, proceed as follows:

Remove resistor R12 and all the amplifier to run continuously until the heatsink temperature reaches a temperature of 90° to 95°C.

Select the value of resistor R12 which decreases the output power by approximately 0.5 to 1 watt. Note that the value of R12 may be as low as zero ohms i.e. a wire link.

The drive control circuit is now correctly operative and will automatically control the drive and heat-sink temperature.

5.17 POWER SUPPLY BOARD

5.17.1 References

Circuit Diagram Number	Figure 19
Manufacturing Code	DP351130 (14-LMU-3A)

5.17.2 Performance

Input	nominal +13.8V
	(11.0V to 15.2V)
Output	+9V regulated receiver supply
	+9V regulated transmitter supply on P.T.T.
	+9V regulated continuous supply
	Antenna switching supply

the antenna switching line is switched to ground thus the antenna circuit is connected to the transmitter output.

The isolating diodes D5 and D6 provide a continuous +9V output irrespective of the P.T.T. operation.

5.17.4 Fault Location

a) Remove the crystal from the transmitter oscillator.

b) Switch on and check that the voltage on the +9V Rx pin (yellow) is between 8.4 and 9.6V, on the +9V Tx pin (orange) is OV on the Antenna switch pin (blue) is approximately 8.4V and on the +9V Cont. pin (violet) is approximately 7.5 to 8.7V.

c) Operate the P.T.T. switch and check that the voltage on the orange pin is between 8.4 to 9.6V, on the yellow pin is OV on the blue pin is approximately OV and on the violet pin 7.5 to 8.7V.

d) Release the P.T.T. switch and connect the multimeter set to the lamp d.c. range between the yellow and black pins i.e. +9V supply to ground. Check that the short circuit current is between 260mA and 340mA.

5.18 SIDE-BOARDS AND FRONT PANEL

5.18.1 References

Circuit Diagram Number Figure 20
Figure 21
Figure 22
Figure 23
Figure 24
Figure 25

The transmitter and receiver side boards form the side members of the main assembly. They locate and secure all of the printed circuit boards (except the power supply board) and also route the supplies to the boards and the front panel components and microphone handset.

Components mounted on the side panels include the filter components for the input d.c. supply leads and the loudspeaker leads, the supply polarity protection diode and various supply by-passing capacitors.

Quick-release spade connectors are provided for the loudspeaker output from the A.F. and Squelch Board and for the microphone handset leads, all other leads being soldered to the printed circuitry.

The basic front panel assembly includes the Power Supply Board the ON/OFF switch and lamp, the muting and volume controls and the front facia. A complete list of the possible additional facilities is given in Section 1.3 (Facilities). In extended and remote operation all components other than the Power Supply Board are located within a separate control head, interconnection being made via a multiple pin socket mounted on the front panel.

5.18.3 Fault Location

All the circuits on the side boards are tested when completing the tests on the respective transmitter and receiver boards and thus no special tests are applicable.

5.18.2 General

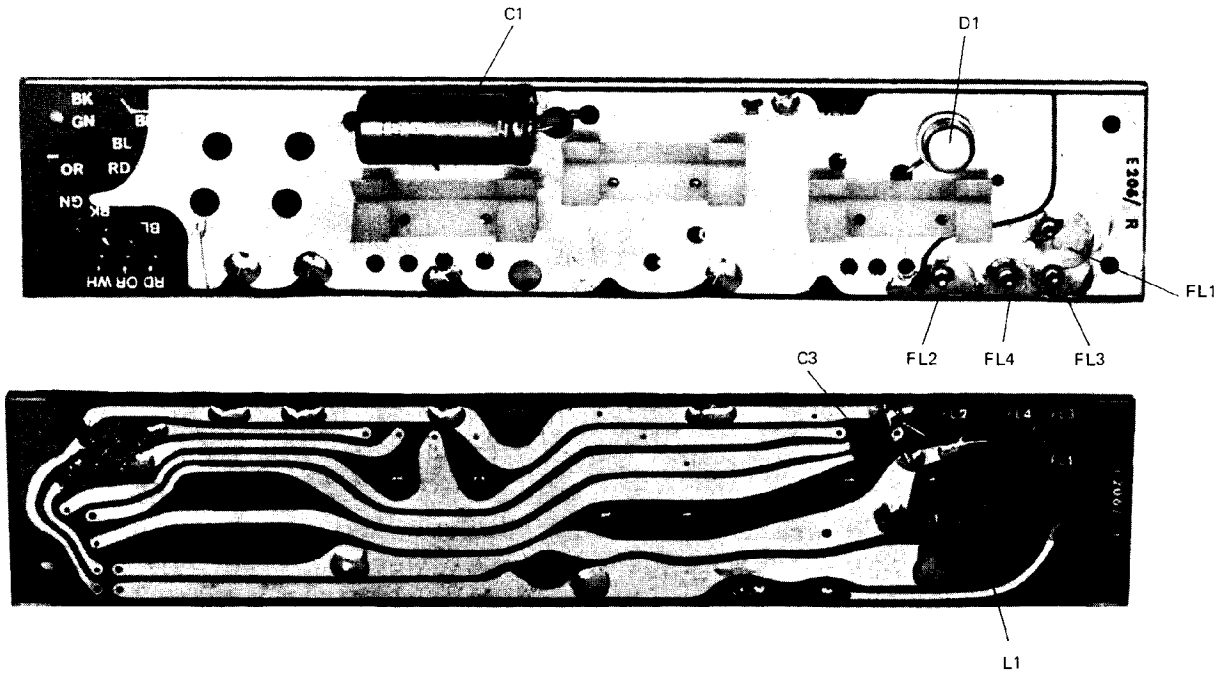


Figure S5.16 Transmitter Side Board

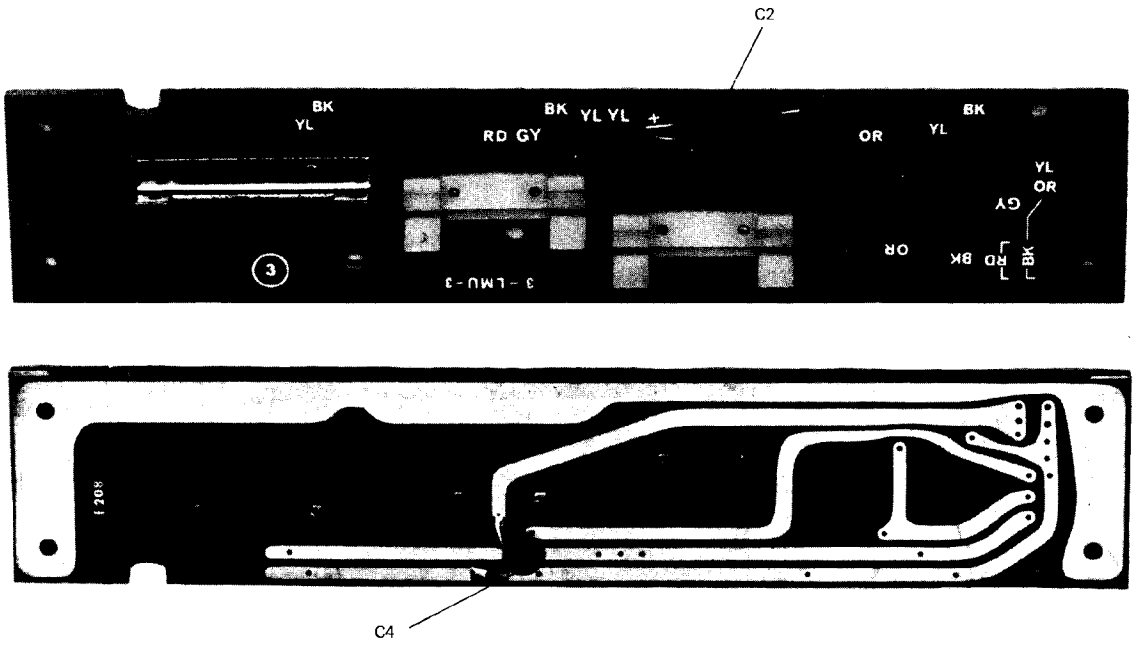


Figure S5.17 Receiver Side Board

5.17.3 Circuit Description

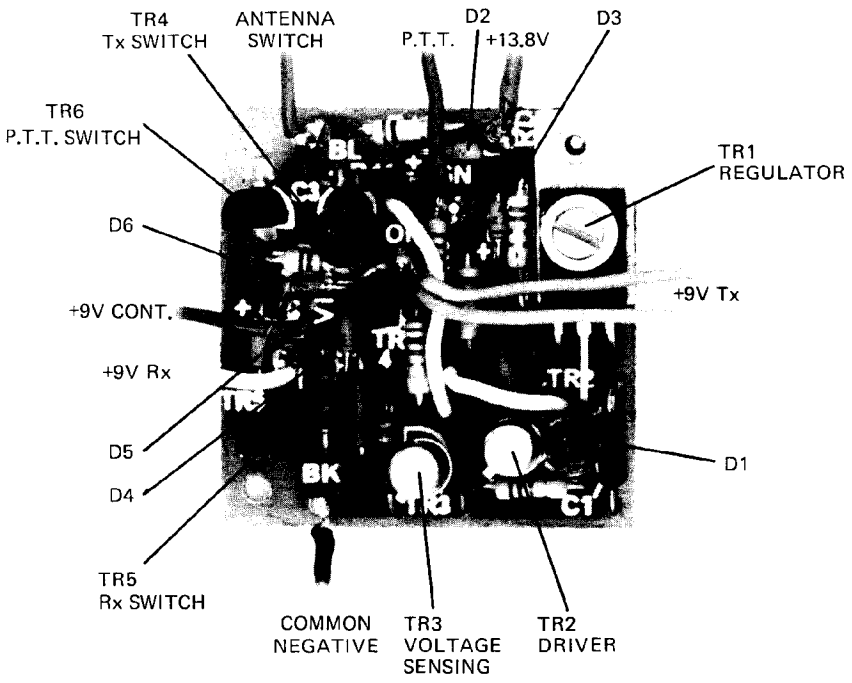


Figure S5.15

Power Supply Board

The power supply board provides switched stabilised +9V supplies for the low level transmitter and receiver sections and a switched supply to operate the antenna switching circuit. The switching sequence is governed by the operation of the microphone P.T.T. switch.

A reference voltage is established across the zener diode D1 and is applied to one side of the comparator circuit TR2/TR3. Any change in the regulated output voltage is applied to TR3 via the isolating diodes D5 or D6. This change is counteracted by a corresponding decrease or increase (as applicable) in base current and consequently collector current of the pass transistor TR1. The network R2, D2 and D3 provide output current limiting.

Transistors TR4 and TR5 provide switching of the regulator output to either the transmitter or receiver circuits respectively. The receive condition is regarded as the normal state and consequently TR5 is normally conducting. When the P.T.T. switch is operated the P.T.T. line is grounded and TR4 is biased into conduction (TR5 is therefore biased off and the supply to the receiver inhibited) and consequently the +9V is applied to the transmitter circuits. Simultaneously TR6 conducts and

In the 'receive' condition the 'aerial switch' voltage approaches +13.8V and the '+9V Tx' supply is removed i.e. zero voltage. The diodes therefore are reverse biased and the received signal is coupled through the aerial filter to the receiver input, the low impedance power amplifier output being isolated by the reverse biased diodes D3/D4.

The low pass aerial filter, being common to the transmitter and receiver, attenuates the transmitter output harmonics to an acceptable level and provides a degree of wide band selectivity for the receiver input. The filter components comprises obvious the L/C components combined with the line impedance created by the various diode network transformed by the receiver line X8.

5.16.4 Alignment

a) Check that the +13.8V supply is connected and that the +9V Tx supply is within the limits 8.4 to 9.6V.

b) Adjust the following controls, in the order given, to achieve maximum indicated output power, C5, C10, C14, C18 and C19, the output power being 25 watts.

5.16.5 Operating Parameters

Typical operating parameters are listed below.

Transistor	Collector Current	
	No Drive	With Drive
TR1	17mA	180mA
TR2	1mA	700mA
TR3	0	3.2A

	Transmit	Receive
+9V Tx Supply	9.4V	0
Aerial Switch Voltage	0	13.8V
Aerial Switch Current	40mA	0
Input Power	150mW min. (50 ohms)	
Output Power	25 watts	

5.16.3 Circuit Description

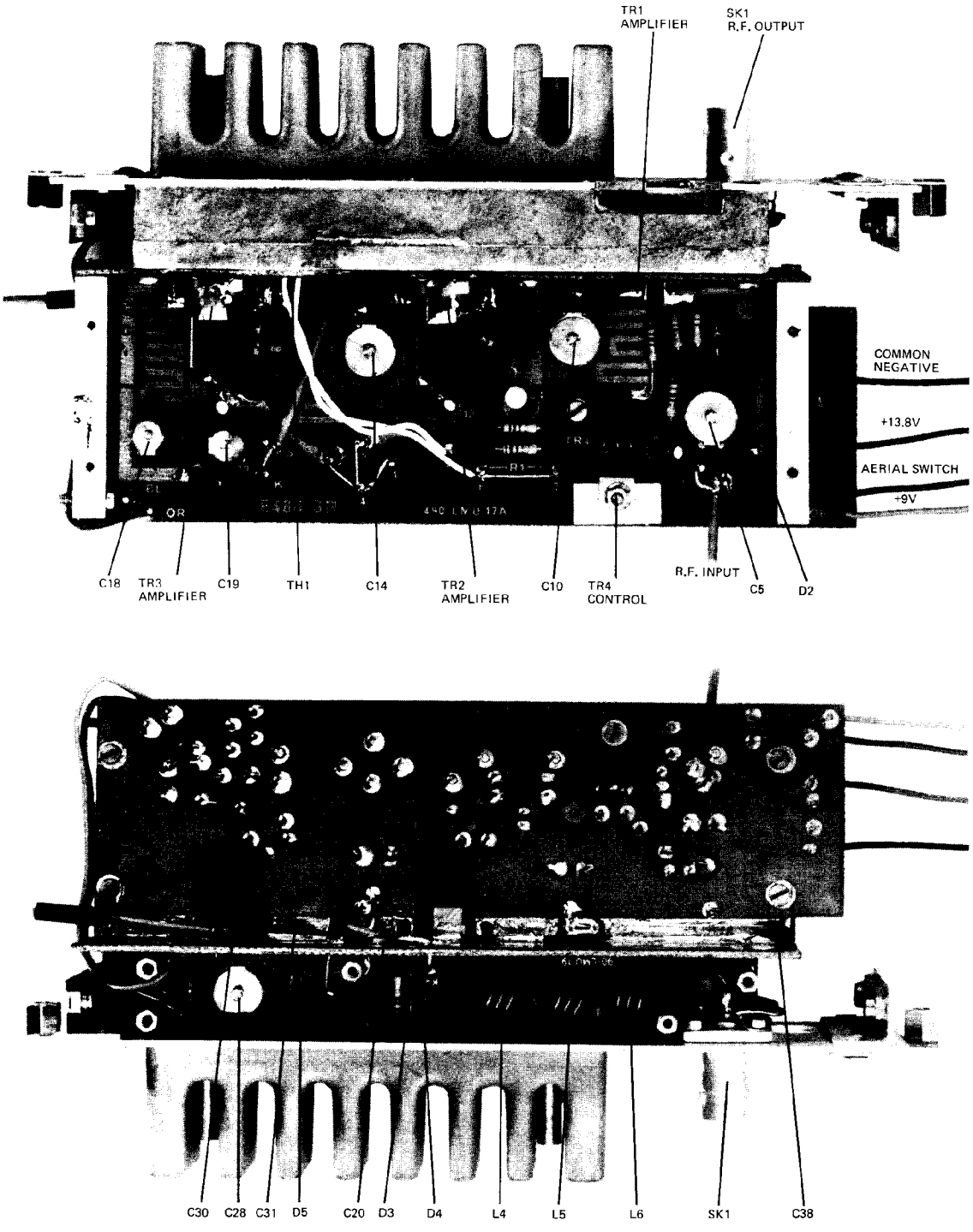


Figure S5.14

R.F. Power Amplifier, 25 W, High Band

The multiplier output (nominal 150mW) is coupled to the input of the two stage power amplifier comprising TR1 and TR2 to produce a nominal 10 watt output.

The output power being measured at the output port and includes the switch and low pass filter insertion losses.

Transistor TR1 functions with a degree of forward biasing derived from the diode network D1. Strip-line techniques are utilised for both interstage coupling and the collector tuning circuits.

The output of the power amplifier is coupled to the aerial via a diode transmit/receive switch and a low pass filter.

In the 'transmit' condition the '+9V Tx' supply is applied to the switch diodes D5 and D3. The return path is via L3 and the conducting antenna switch transistor TR6 (located on the Power Supply board). Diode D3 in a conducting state forms a low impedance path for the transmitter signal to the aerial whereas the quarter wave line X8 converts the low impedance path of D5 and C27/C28 to an effective open circuit across the signal path thus isolating the transmitter output from the receiver input. Capacitor C28 is adjusted for resonance at the particular carrier frequency to achieve maximum isolation.

In the 'receive' condition the 'aerial switch' voltage approaches +13.8V and the '+9V Tx' supply is removed i.e. zero voltage. The diodes therefore are reverse biased and the received signal is coupled through the aerial filter to the receiver input, the low impedance power amplifier output being isolated by the reverse biased diode D3.

The low-pass aerial filter, being common to the transmitter and receiver, attenuates the transmitter output harmonics to an acceptable level and provides a degree of wide band selectivity for the receiver input. The filter components comprise the obvious L/C components combined with the line impedance created by the various diode networks transformed by the receiver line X8.

5.15.4 Alignment

a) Check that the +13.8V supply is connected and that the +9V Tx supply is within the limits 8.4 to 9.6V.

Input R.F. voltage	approximately 3V rms
Input Power	50mW min. (50 ohms)
Output Power	25 watt

5.14.6 Control Circuit

1) With the amplifier functioning correctly, measure the heat sink temperature with a contact thermometer (ensuring good thermal contact by employing a suitable thermal conducting paste and placing the probe into the corner of rear panel and the finned casting).

2) Allow the amplifier to run continuously and check that the heatsink temperature stabilises at an operating temperature of 90 to 95°C.

Should it be necessary to adjust the temperature control due to an associated component change, proceed as follows:

Remove resistor R12 and allow the amplifier to run continuously until the heatsink temperature reaches a temperature of 90 to 95°C.

Select the value of resistor R12 which decreases the output power by approximately 0.5 to 1 watt. Note that the value of R12 may be as low as zero ohms i.e. a wire link.

The drive control circuit is now correctly operative and will automatically control the drive and heatsink temperature.

5.15 RF POWER AMPLIFIER (10 WATT HIGH-BAND)

5.15.1 Reference

Circuit diagram number	Figure 17
Manufacturing Code	DP351629 (28-LMU-14C)

5.15.2 Performance

Input power	150mW
Output power	10W
Frequency	144 to 174 MHz

The transmitter power amplifier comprises four separate printed circuit boards, the R.F. board, an intercoupling board, the aerial filter and the aerial switching circuit. The boards are contained within metal enclosures to form a complete module with the power transistor heatsink as part of the rear panel. Refer to Section 5.4.10 for the disassembly procedure.

The multiplier output (nominal 50mW) is coupled to the input of the three stage power amplifier comprising TR1, TR2, and TR3, to produce a nominal 25 watt output. The output power being measured at the output port and includes the aerial switch and low-pass filter insertion losses.

Discreet inductors are used in the collector tuning circuits whereas strip-line techniques are utilized for interstage coupling.

The power amplifier circuitry includes provision for the control of the drive to the output stages by means of control of the collector supply to the first stage. The function of the control is to prevent excessive temperature rise in the transistor junctions should the mobile unit be operated in a continuous mode. A level of output power, dependent on the ambient temperature, will be established and will maintain the amplifier module heatsink at a temperature of a little in excess of $90^{o}C$ due to the device power dissipation. The control to the first stage is accomplished by means of a series supply transistor/thermistor combination TR4/TH1, such that an increase in heatsink temperature causes a decrease in thermistor resistance with a corresponding decrease in the collector supply, thus decreasing the effective drive to the final stages.

The output of the power amplifier is coupled to the aerial via a diode transmit/receive switch and a low pass filter.

In the transmit condition the +9V Tx supply is applied to the switch diodes D2/D5 and D3/D4 via the isolating diode D7. The return path is via D6 since the antenna switch is at ground potential. The diode combinations conduct such that D2/D5 forms a low impedance path for the transmitter signal to the aerial whereas the eight-wave-length line X4 connects the low impedance path D3/D4 and C35 to an effective open circuit across the output signal path thus isolating the transmitter output from the receiver input. Further attenuation of this signal is achieved as diode D1 is reverse biased.

b) Adjust the following controls, in the order given, for maximum indicated output power, C2, C8, C9 and C10, the nominal output power should be 10 watts.

5.13.5 Operating Parameters

Typical operating parameters as listed below:

Transistor	Collector Current	
	No Drive	With Drive
TR1	14mA	170mA
TR2	0mA	1.4A
TR1 base voltage (no drive)	0.35V	

	Transmit	Receive
Junction L11/C34 voltage	6.0V	6.3V
Junction R9/R15 voltage	0.9V	7.8V
Aerial Switch Voltage	0V	13.8V
Aerial Switch Current	68mA	0
+9V Tx Supply	8.8V	0V
Input Power	50mW min (50 ohms)	
Output Power	10 watts	

5.14 RF POWER AMPLIFIER (25 WATT LOW-BAND)

5.14.1 Reference

Circuit Diagram Number	Figure 16
Manufacturing Code	DP351634 (28-LMU-14B)

5.14.2 Performance

Input Power	50mW
Output Power	25W
Frequency	68 to 88 MHz

5.13.3 Circuit Description

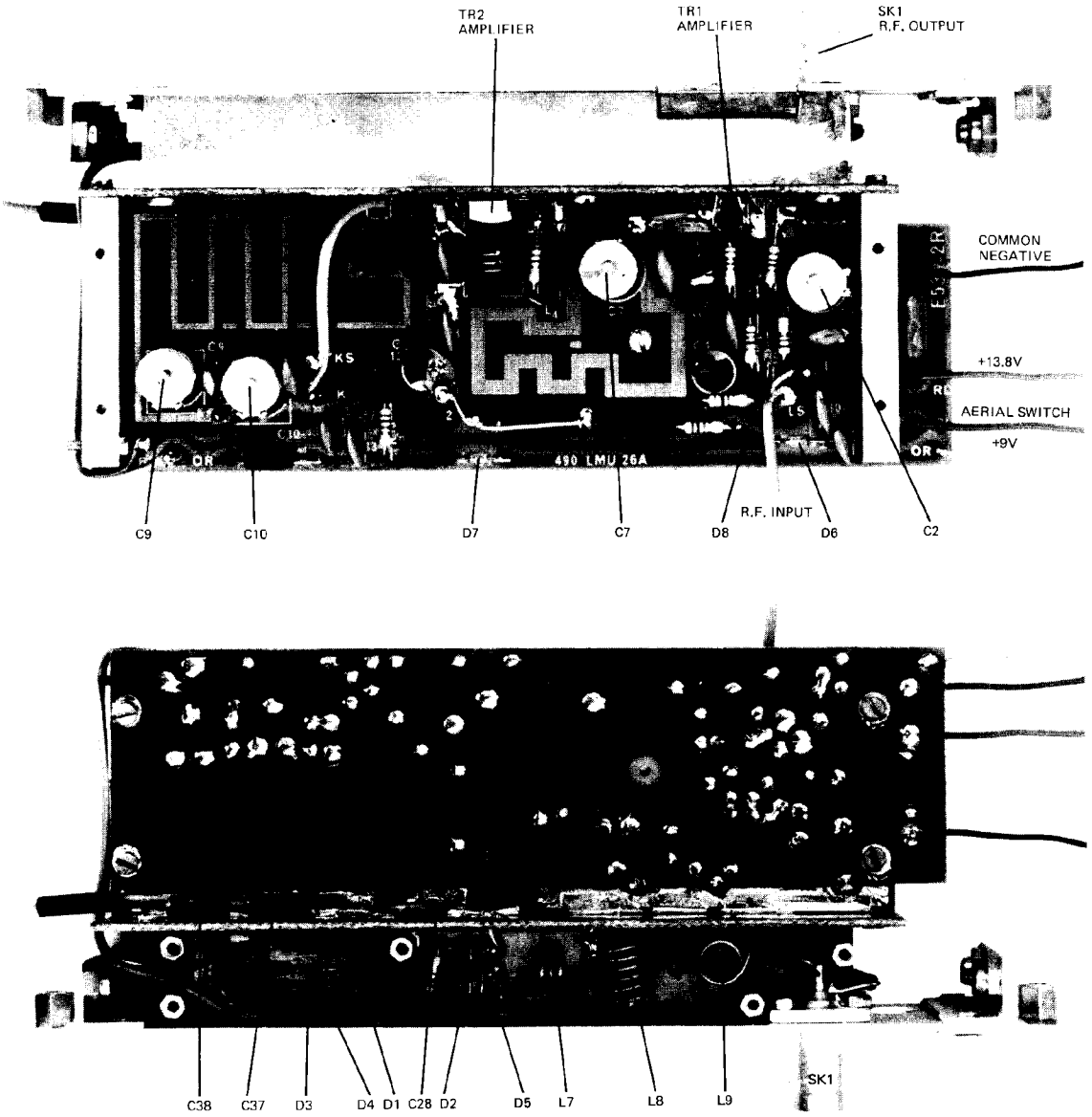


Figure S5.11

Power Amplifier 10W, Low Band

The transmitter power amplifier comprises four separate printed circuit boards, the R.F. board, an intercoupling board, the aerial filter and the aerial switching circuit. The boards are contained within metal enclosures to form a complete module with the power transistor heatsink as part of the rear panel. Refer to Section 5.4.10 for the disassembly procedure.

Note that L6 may have a tuning slug for frequencies below 70 MHz (approximately).

Repeat tuning if necessary, noting that the effective tuning of C17 can only be achieved by monitoring the collector voltage of TR6.

The low-band multiplier output power should be greater than 50mW into 50 ohms.

High-band units:

Adjust in order L2, C17, C22, C25, C29, C32 and C36 by peaking each control for maximum voltage as measured on either the collector or output of the following stage.

Note that L2 may have a ferrite tuning slug for frequencies below 160 MHz (approximately) and a non-ferrous slug for frequencies above 160 MHz.

Repeat tuning if necessary.

The high-band multiplier output power should be greater than 150mW into 50 ohms.

e) Connect an A.F. generator output to the microphone board input. Set the DEV ADJ control fully clockwise and adjust the generator output to produce a carrier deviation of 5KHz. Check that the A.F. voltage at the modulator output (white lead) is less than 50mV. Refer to Section 5.11.4 (h) for the adjustment procedure for the DEV ADJ control.

5.12.5 Operating Parameters

Voltage measurements

Group B (low-band)

Transistor	Function	Voltage D.C. Emitter	Base	Collector
TR1	Modulator	1.3	2.0	5.8
TR2	Modulator	1.4	2.1	5.6
TR3	Modulator	1.4	2.1	5.9
TR4	Amplifier	1.8	2.5	8.7
TR5	Amplifier	1.1	1.8	8.2
TR6	Tripler	0	0.6	13.8
TR7	Amplifier	0.8	1.5	10.8

Frequency of operation

Low-band input	22.65 to 29.33 MHz
output	68 to 88 MHz
High-band input	24.0 to 29.0 MHz
output	144 to 174 MHz

5.12.3 Circuit Description

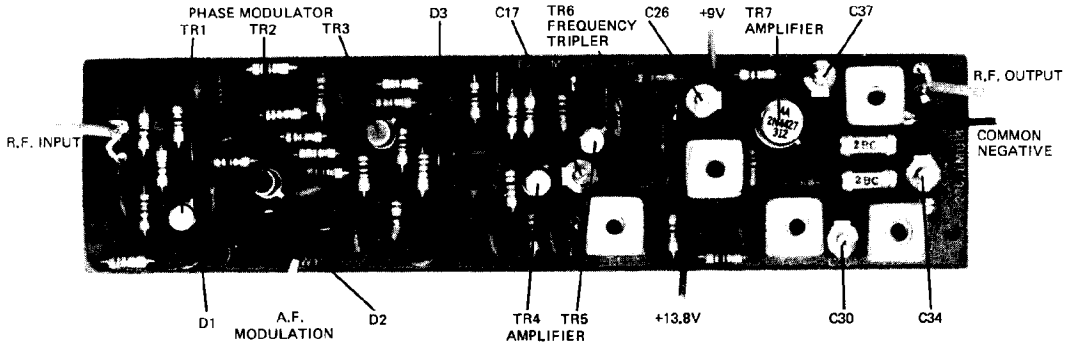


Figure S5.9

Transmitter Multiplier Board - Low Band

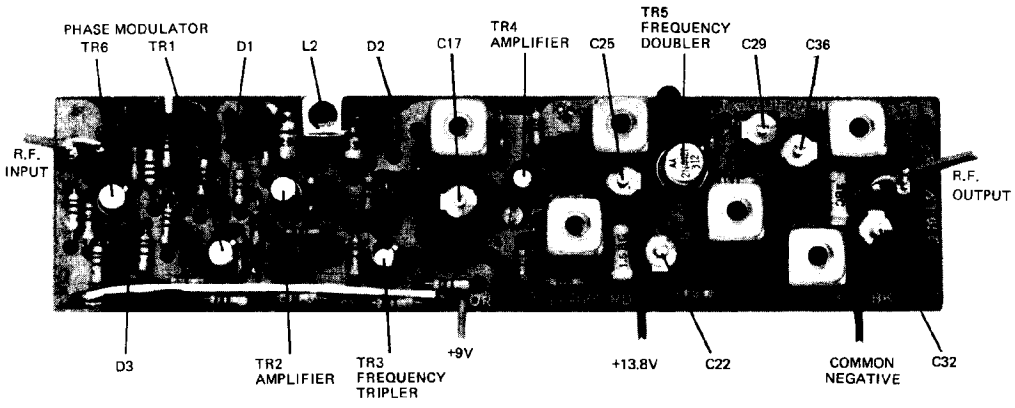


Figure S5.10

Transmitter Multiplier Board - High Band

e) Frequency response check:

Set the generator output to 10mV and check the amplifier output frequency response below limiting and relative to 1KHz is within the following limits.

Frequency KHz	Response db
0.3	+1 to -3
1	0
3	+1 to -3
6	-15 or greater

f) Clipper check:

Connect the oscilloscope to the output of IC1 (pin 3 or junction of R10/R11). Adjust the generator output such that clipping is just visible.

Increase the generator level by a further 20db (ten times) and check the operation of the clipper circuit.

g) Clipper frequency response check:

Adjust the generator level to 200mV at 1KHz and adjust the MIC SENS control such that the output of IC1 is just clipping. Increase the generator level by a further 20db i.e. 2V and check that the amplifier frequency response while limiting and relative to 1KHz is within the following limits.

Frequency KHz	Response db
0.3	+11.5 to +7.5
1	0
3	-6.5 to -10.5

h) Final adjustment:

Adjust the generator level (1KHz) until slipping just occurs and then increases this level by a further 20db.

Adjust DEV ADJ (R23) control for a maximum deviation of 5 KHz. Check that the amplifier input to produce a deviation of 3.5KHz is 1mV or less.

Transistor	Function	Voltage D.C. Emitter	Base	Collector
8 Channel Receiver Oscillator				
TR1	Amplifier	.7	1.45	9.0
TR2	Oscillator	3.3	3.8	8.6
TR3	Oscillator	4.0	4.45	9.0
+9V Receiver Supply			9V	
+9V Transmitter Supply			9V	

5.11 TRANSMITTER MICROPHONE AMPLIFIER BOARD

5.11.1 References

Circuit Diagram Number	Figure 12
Manufacturing Code	DP351050 (28-LMU-4A)

5.11.2 Performance

Input Level	1mV
Output Level	approximately 50mV
Input Frequency	300 to 3500Hz
Input Impedance	Nominal 300 ohms unbalanced

5.11.3 Circuit Description

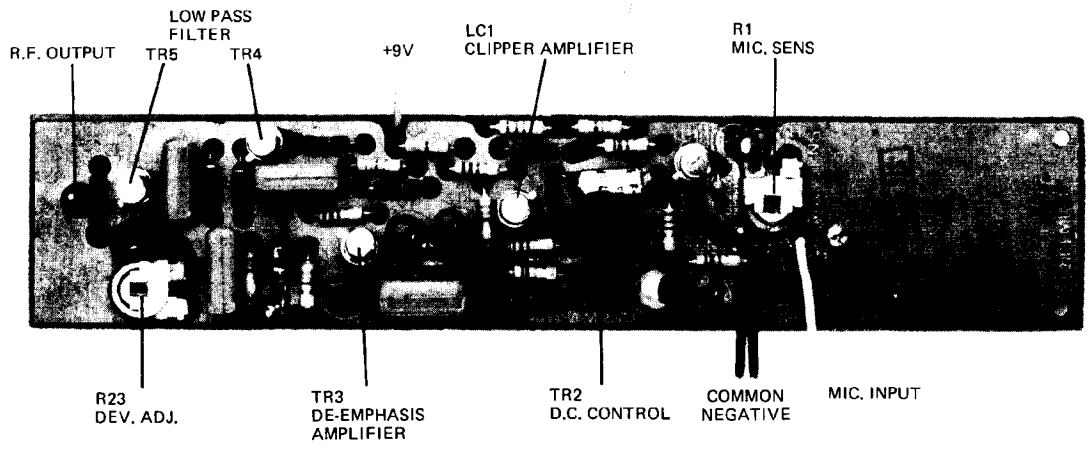


Figure S5.8

Transmitter Microphone Amplifier Board

The transmitter oscillator output is coupled to the Multiplier Board input and the receiver oscillator output is coupled to the receiver multiplier input (located on the R.F. Board) for injection into the mixer circuit. The multi-channel oscillator circuits are arranged in groups of four channels per oscillator, the output from each group being coupled to the input of a common buffer amplifier. The eight channel board has therefore two groups of four channels whereas a third such group is added for the twelve channel board.

The oscillator transistors TR2, TR3 and TR4 operate in the common-base mode with feedback via a isolating transformer between collector and emitter. The frequency of oscillation is determined by the series-resonant emitter circuit which includes the appropriate crystal SL1 - XL12. Individual frequency trimming L/C circuits are provided for each crystal. Selection of a particular oscillator channel is achieved by switching the common negative to the appropriate biasing circuit. If for example channel one is selected the emitter circuit of TR2 is completed via the diode D11 and resistor R12, thus permitting oscillation to occur at the frequency of crystal XL1. All other unswitched emitter diodes are reversed biased thus achieving isolation of all crystals other than that selected.

The oscillator tuned collector output is coupled to the base of the buffer transistor TR1 via isolating resistors R205 etc. The emitter of TR1 is unby-passed and the collector transformer untuned to provide a broadband, high impedance buffer load to the oscillator circuit.

The +9V supply is connected to the transmitter oscillator (orange) when the P.T.T. switch is actuated, at all other times, the +9V supply is connected to the receiver oscillator (yellow). The supply switching is on the power supply board.

The only difference between transmitter and receiver oscillators is in the value of the biasing resistors associated with the buffer transistor TR1. Refer to the circuit diagram table for values.

5.9.5 Operating Parameters

Voltage measurements

Transistor	Function	Voltage D.C. Emitter	Base	Collector
TR1	Amplifier	1.3	2.0	8.6
TR2	Oscillator	3.25	3.8	8.2
TR3	Oscillator	3.25	3.8	8.4
TR4	Amplifier	0.6	1.2	8.8

+9V Receiver Supply	8.8V
+9V Transmitter Supply	8.6V

5.10 TRANSMITTER/RECEIVER OSCILLATOR BOARD - EIGHT & TWELVE CHANNEL

5.10.1 References

Circuit Diagram Number — Figure 11

Manufacturing Code

Transmitter	12 Channel	DP342126 (16-LMU-7A)
Receiver	12 Channel	DP342127 (16-LMU-7B)
Transmitter	8 Channel	DP342129 (16-LMU-7E)
Receiver	8 Channel	DP342130 (16-LMU-7F)

5.10.2 Performance

Crystal Controlled Oscillators

Frequency	
Transmitter	22.66 to 29.33 MHz
Receiver	28.65 to 40.825 MHz
Output Power	50mW into 50 ohms
Frequency Stability	$\pm$ 0.001% over $-10^{o}C$ to $+60^{o}C$ with reference to $+24^{o}C$
Channels	Eight and twelve channels (switched)
Crystal Specification	Plug in style to STC 1012

5.9.3 Circuit Description

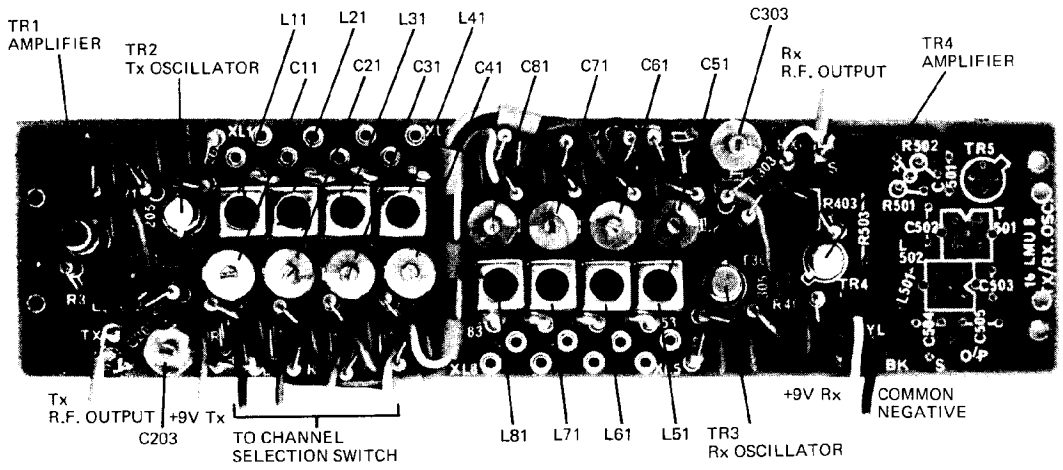


Figure S5.6

TX/RX Oscillator Board, Four Channel

The four channel equipment employs two separate transmitter/receiver oscillators on the one board. Four channels for each oscillator may be obtained by switching to the appropriate crystal. The transmitter oscillator output signal is coupled to the transmitter multiplier board input and the receiver oscillator output to the receiver multiplier input (located on the R.F. board) for injection into the mixer circuit.

The oscillator transistors TR2 and TR3 operate in the common base mode with feedback via an isolating transformer between collector and emitter. The frequency of oscillation is determined by the series-resonant emitter circuit which includes the appropriate crystal XL1 - XL8. Individual frequency trimming L/C circuits are provided for each crystal. Selection of the particular oscillator channel is achieved by switching the common negative to the appropriate biasing circuit. If for example channel one is selected, the emitter circuit of TR2/TR3 is completed via diode D11/D51 and resistor R12/R52 thus permitting oscillation to occur at the frequency of crystal XL1/XL5. All other unswitched emitter diodes

transmitter multiplier board input and the receiver oscillator output to the receiver multiplier input (located on the R.F. Board) for injection into the mixer circuit.

The oscillator circuits are similar, with a crystal oscillator stage followed by an amplifier output stage. The oscillator transistors TR1 and TR3 operate in the common-base configuration with the series resonant frequency control crystals XL1 and XL2, respectively, included in the feedback path from the collector tuned circuit to the emitter.

The buffer transistors TR2 and TR4, respectively, having an unby-passed emitter and an untuned collector circuit provide, a broadband, high impedance buffer load to oscillator circuit.

The +9V supply is connected to the transmitter oscillator (orange) when the P.T.T. switch is actuated, at all other times the +9V supply is connected to the receiver oscillator (yellow). The supply switching circuit is on the power supply board.

5.8.4 Alignment

Warning:

Ensure that the power amplifier (if connected) cannot be operated unless correctly terminated.

a) Set C4/C12 to mid-value capacitance and the slotted-end of the slug in L2/L4 approximately 6 turns into the coil former.

b) Connect the voltmeter and 50 ohm load (if necessary) across the oscillator output and adjust C6/C14 for maximum output approximately 0.5V. Operating the P.T.T. switch as applicable.

c) Connect the frequency counter to the oscillator output and adjust C4/C12 (coarse) and L2/L4 (fine) to produce the correct output frequency.

5.8.5 Operating Parameters

Voltage measurements

f) Reduce the R.F. generator level to 0.35uV p.d. and adjust the MUTING control until the set is muted then reverse the direction of rotation slowly until the mute just reopens.

Decrease the generator level slowly until the mute closes. The generator level variation between opening and closing mute should be approximately 2db.

g) Increase the generator level to luV p.d. and check that the MUTING control is still operating.

5.7.5 Operating Parameters

Voltage measurements - No R.F. Signal

Transistor	Function	Voltage		
		Emitter	Base	Collector
TR1	De-emphasis	1.8	2.4	6.4
* TR2	Amplifier	0.5	1.2	5.0
TR3	Filter	4.3	5.0	9.2
TR4	Pre-amplifier	0.6	1.3	6.8
TR5	Bias Control	6.7	7.4	8.5
TR6	Driver	7.9	8.5	13.8
TR7	Driver	7.4	6.8	0.5
TR8	Power Output	7.4	7.9	13.8
TR9	Power Output	0	0.5	7.4
TR10	Noise Amplifier	0.7	1.4	8.3
* TR11	Muting Control	0.4	1.1	0.4
* TR12	D.C. Switch	0	0.1	1.2
* Preset muting control fully anti-clockwise				
+ TR2	Amplifier	0	0.03	9.2
+ TR11	Muting Control	0	-0.05	3.5
+ TR12	D.C. Switch	0	0.65	0.03
+ Preset muting control fully clockwise				
	+9V Rx Supply	9.2V		

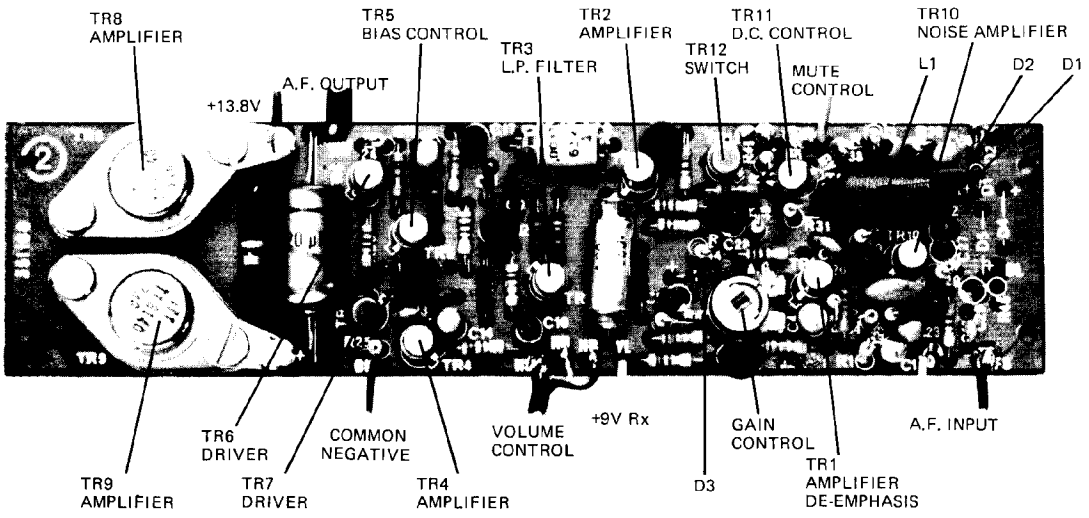


Figure S5.4

Receiver A.F. and Squelch Board

The voltage amplifier TR4 drives TR6 and TR7 operating in class AB. The output of this complementary pair switches TR8 and TR9 such that the output capacitor is alternately charged and discharged.

The output is boot-strapped to the collector circuit of TR4 via C16 to increase the input impedance and achieve a greater collector swing. An additional feedback loop to the base of TR4 reduces A.F. distortion and stabilises the operating d.c. levels.

Transistor TR5 maintains a constant base potential between the bases of TR6 and TR7 thereby reducing cross-over distortion.

The incoming signal and noise is also coupled to a tuned-collector noise amplifier TR10. Diodes D1/D2 rectify the amplifier noise signal to produce a negative bias voltage coupled to the base of the switch transistor TR11.

In the absence of a received carrier signal the noise level will be substantial, the switch transistor TR11 will be cut off causing the gating transistor TR12 to conduct and effectively place a short-circuit at the base of the pre-amplifier stage TR2 so that the main A.F. circuit is muted.

vector component at 90° from the R.F. signals applied to the ends of L1 and phased 180° apart. The vector sum varies in amplitude according to the instantaneous frequency to produce an A.F. output. This A.F. signal plus noise is amplified and consequently coupled to the input of the A.F. and Squelch Board.

5.6.4 Alignment

Connect the R.F. Generator to the aerial socket and the D and N Meter to the loudspeaker output.

a) Check that the +9V Rx supply is within the limits 8.4 to 9.6 volts.

b) Set the generator to frequency with an output level of 10uV with a modulating frequency of 1KHz and a deviation of 5KHz (assuming the R.F. Board is functioning correctly).

c) Adjust L1 for maximum output as indicated on the D and N Meter or a voltmeter connected across the output terminals E/Es.

This output should be greater than 150mV r.m.s. for an input 10.7 MHz level of 1mV and a frequency deviation of 5 KHz.

d) Adjust T1 for best signal-to-noise at the loudspeaker output, reducing the generator level as required. (VOLUME control at a suitable level and the receiver unmuted).

The output signal-to-noise should be approximately 15db for a generator output level of 0.35uV or a 10.7 MHz input level of 10uV.

5.6.5 Operating Parameters

Voltage measurements

Circuit Reference	Function	Pin No.	V d.c.
IC1	IF Amplifier	1	-
		2	3.0
		3	0
		4	2.1
		5	6.0
		6	8.5
		7	8.8
		8	-

and the second frequency doubler in the multiplier unit is replaced by an amplifier stage.

5.5.4 Alignment

Connect the RF Generator to the aerial socket and the D and N meter to the loudspeaker output.

a) Check that the +9V Rx supply is within the limits 8.4 to 9.6 volts.

b) On multi-channel equipment, select the centre-channel and check that the oscillator output voltage is approximately 0.5V.

c) Adjust C3, C4 and C7 in the Multiplier Unit for maximum output at terminals A/AS. This level should be greater than 0.5V. Check the oscillator frequency and adjust if necessary. (The desired frequency being equal to R.F. carrier -10.7 MHz).

d) With the R.F. generator at a level of 200mV, adjust in the order given, C13, C8, C6, C2, C1, C7, T2 and T3 for either maximum overall SINAD or maximum voltage at terminals C/CS. Reducing the generator level as required.

e) Repeat until no further increase is observed (including C10 if applicable i.e. high-band units).

f) Adjust the generator level to produce an output voltage of 50mV at terminals C/CS. The generator level should be less than 1mV p.d.

g) Reduce the generator level to zero and check that the board output level is less than 10mV.

5.5.5 Operating Paramaters

Voltage measurements:

Circuit Reference	Function	Source	G1	G2	Drain
R.F. Board					
TR1 (high-band)	R.F. Amplifier	1.8	0	4.5	8.0
TR1 (low-band)	R.F. Amplifier	1.0	0	1.4	8.5
TR2	I.F. Amplifier	1.6	0	4.0	8.0

Multiplier Unit ('no drive" condition)

		Emitter	Base	Collector
TR1	First Doubler	0	0.6	8.8
TR2 (high-band)	Second Doubler	0	0.6	8.8
TR2 (low-band)	Amplifier	0	0	8.8
+9V Rx Supply		8.8V		

5.5.2 Performance

Input Frequency	
Low-Band	68 to 88 MHz
High-Band	144 to 174 MHz
Multiplier Input Frequency	
Low-Band	28.65 to 38.65 MHz
High-Band	33.325 to 40.825 MHz
Multiplier Output Frequency	
Low-Band	57.3 to 77.3 MHz
High-Band	133.3 to 163.3 MHz
Output Frequency	10.7 MHz
Input R.F. level	0.35uV p.d. (min) for 12 db SINAD
Multiplier input level	0.5V min. into 50 ohms
Output level (10.7 MHz)	50mV into 50 ohms for less than 1mV p.d. input.

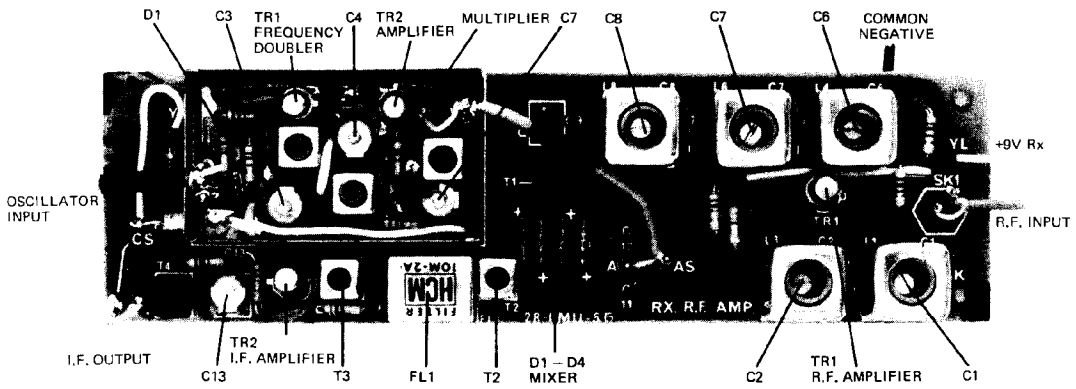


Figure S5.1

Receiver R.F. Board, Low Band

5.4.9 Transmitter Microphone Amplifier Board

Disconnect the orange '+9V' lead, the white 'microphone' lead, the black 'microphone' lead, the black earth lead and the white modulator output lead.

Remove the two end screws and withdraw the board.

5.4.10 Transmitter Power Amplifier Board

The Power Amplifier Board, antenna filter and switch, the back panel and external heatsink (25 watt units only) are essentially one module. The removal is as follows:-

Disconnect the Receiver input co-axial lead and the earthing strap.

Disconnect the P.A. input co-axial lead from the multiplier board.

Disconnect the red '+12V' lead, the orange '+9V' lead, the blue 'antenna switch' lead and the black 'earth' lead.

Disconnect the power supply red/blue and black/green leads, and the loudspeaker black and white leads from the side panel capacitors.

Remove the four side-panel screws and withdraw the assembly.

Remove the external heatsink (if applicable)

Remove the aerial switch cover (five screws) and unsolder the aerial socket leads (a capacitor and an inductor).

Remove the power transistor mounting stud nuts.

Remove the four counter sunk back panel screws and separate the panel from the assembly.

Further breakdown is determined by the extent of replacement and the necessary steps are straight forward.

5.4.11 Power Transistor Replacement

Remove the power amplifier cover.

Remove the external heatsink, if applicable.

Remove the appropriate mounting stud nut.

Remove the receiver R.F. board to gain access to the rear of the P.A. Board.

Unsolder and remove the transistor.

Refer to Section 5.2.6 for precaution notes in the replacement of the power transistors.

5.3 TEST EQUIPMENT

Refer to Section 3.2 for a tabulated list of the suggested test equipment.

5.4 BOARD REMOVAL

First remove the four retaining screws and withdraw the unit from the mounting case.

5.4.1 Receiver RF Board

Disconnect the output co-axial lead from terminals C and CS.

Disconnect the aerial input co-axial lead from SK1.

Disconnect the yellow +9V lead.

Disconnect the rear panel earthing lead (extreme R.H.S.)

Remove the two end screws and withdraw the board.

5.4.2 Receiver IF Board

Disconnect the input lead from terminals C and CS (R.F. Board).

Remove Capacitor C2 from the side panel for access.

Disconnect the output leads from the AF board, terminals FO and FS.

Disconnect the yellow '+9V' lead.

Remove the two end screws and withdraw the board.

5.4.3 Receiver AF and Squelch Board

Disconnect the input leads from terminals FO and FS.

Disconnect the red '+12V' lead, the yellow '+9V' lead, the grey '+9V' 'muting" lead and if applicable the brown 'squelch' lead and the blue 'noise monitor' lead.

If necessary disconnect the shielded 'volume' leads from terminals HR, HS, and HB.

Remove the two quick release spade terminals from the loudspeaker AF output on the side panel.

Remove the two end screws and withdraw the board.

5.4.4 Transmitter/Receiver Single Channel Oscillator Board

Disconnect the transmitter oscillator output from terminals D and DS.

be kept to the minimum required for practical purposes. Avoid excessive heat by using heat shunts. Always check that the hole in the printed-circuit track is clear of solder before fitting a component. Where possible a low voltage d.c. soldering iron should be used with an earthed bit.

5.2.4 Printed-Circuit Boards

Take particular care not to bend a printed-circuit board when removing and replacing it or when working on it. Bending can cause hairline breaks in the printed-circuit tracks and such breaks are very difficult to locate. Do not connect test leads to a printed-circuit track.

Buzzers must not be used for continuity checks as this may damage semi-conductor devices.

5.2.5 Field-Effect Transistors

Particular attention should be made if it becomes necessary to replace the field-effect transistors (FET) on the receiver RF board. A low voltage soldering iron should be used preferably from a d.c. supply or having an earthed bit.

Replacement FET's may be supplied with either several turns of thin tinned copper wire wound round the leads or with a conductive rubber shorting ring. Replacement must be achieved with either shorting ring still intact while soldering to prevent excessive voltages from being applied to the electrodes. When the transistor has been satisfactorily soldered in position, the shorting ring must be removed. Do not solder or even touch the leads unless such a shorting ring is attached.

5.2.6 Power Transistors

Although the strip line package is a rugged assembly, some care in handling should be observed. The most important mechanical parameter is stud torque, the general limit being 5-6 inch-pounds.

Avoid upward pressure on the leads near the case. Such stress can occur due to solder build-up on the copper foil when a device is being replaced. Take care to flow all solder away from the mounting area before the replacement device is attached and carefully tighten the stud nut before the leads are soldered.

SECTION 6 - SCHEDULE OF COMPONENTS

6.1 SUPPLIERS/MANUFACTURERS KEY NUMBERS

In the schedule of components key numbers are used in place of the names of suppliers and/or manufacturers. Provision is made for giving both the names, however where the manufacturer is also the supplier, only one key number, in the manufacturer column of the schedule, is given. Where it is desirable to identify the manufacturer when ordering from a supplier both the suppliers number and manufacturer's number are listed.

The key numbers are allocated as follows:-

1. Standard Telephones and Cables Pty. Limited,
Moorebank Avenue,
Liverpool. N.S.W. 2170.

7. Amalgamated Wireless Valve Co. Pty. Ltd.,
P.O. Box 24,
Ashfield. N.S.W. 2131.

14. Plessey Pacific Pty. Ltd.,
Ducon Division,
Christina Road,
Villawood. N.S.W. 2163.

17. International Resistance Holdings Pty. Ltd.,
The Crescent,
Kingsgrove. N.S.W. 2208.

57. Morganite Australia Pty. Ltd.,
65-67 Bourke Road,
Alexandria. N.S.W. 2015.

78. Mullard-Australia Pty. Ltd.,
35-43 Clarence Street,
Sydney. N.S.W. 2000.

86. Hewlett Packard Co.,
275 Page Mill Road,
Palo Alto,
California. U.S.A.

131. Painton (Aust.) Pty. Ltd.,
6 Pacific Highway,
St. Leonards. N.S.W. 2065.

155. Nippon Electric Co. Ltd.,
7-15 Shiba Gochome,
Minato-Ku. Tokyo. Japan

270. Philips Allied Industries
443 Concord Road,
Rhodes. N.S.W. 2136.

271. Jackson Bros.,
Kingsway Waddon,
Croydon. U.K.

272. Hawker Siddeley Elect. Components Ltd.,
752 Pittwater Road,
Brookvale. N.S.W. 2100.

273. Printed Electronic Components Company
13 Enterprise Avenue,
Padstow. N.S.W. 2211.

274. Delevan Electronics Corporation/Division,
270 Quaker Road,
East Aurora,
New York. 14052. U.S.A.

275. Kamaya Electric Company Ltd.,
1-3.2 Chrome Shinbashi,
Minato-Ku,
Tokyo. Japan.

276. Erie Electronics Limited,
South Denes,
Great Yarmouth,
Norfolk. U.K.

277. Hitachi,
5-1, 1-Chone,
Marunouchi,
Chiyoda/Ku,
Tokyo. 100. Japan.

278 Sprague Electric Co.,
115 Northeast Cutoff,
Worcester,
Mass. 01606. U.S.A.

279. Okaya Electric Industries Co. Ltd.,
1-8-3, Shibuya,
Shibuyaku,
Tokyo. 150. Japan.

6.2 RECEIVER R.F. AMPLIFIER BOARD – LOW BAND

DP351601 (28-LMU-58)

Refer to Fig. No.5

Item	Circuit Function	Description	Manufacturer Code	Manufacturer Designation	Supplier Code	STC DP Number
	Capacitors					
C1	Input Tuning	2-10pF Variable	271	C16.5640/ST/10	271	351334
C2	Input Tuning	2-10pF Variable	271	C16.5640/ST/10	271	351334
C3	Supply Decoupling	.001uF Ceramic	276	K2600/831	231	342938
C4	Bypass	.001uF Ceramic	276	K2600/831	231	342938
C5	Bypass	.001uF Ceramic	276	K2600/831	231	342938
C6	Tuning	2-10pF Variable	271	C16.5640/ST/10	271	351334
C7	Tuning	2-10pF Variable	271	C16.5640/ST/10	271	351334
C8	Tuning	2-10pF Variable	271	C16.5640/ST/10	271	351334
C9	Tuning	47pF, 2% NPO Ceramic		2222-638-10479	233	342960
C10	Not Used					
C11	Coupling	220pF, 5% N750 Ceramic		2222-638-58221	233	351303
C12	Coupling	220pF, 5% N750 Ceramic		2222-638-58221	233	351303
C13	Tuning	2-20pF Variable		2222-809-05003	233	351333
C14	Supply Decoupling	.01uF Ceramic	276	K800011/801	231	342937
C15	Bypass	.01uF Ceramic	276	K800011/801	231	342937
C16	Bypass	.01uF Ceramic	276	K800011/801	231	342937
	Diodes					
D1	Mixer	Silicon Signal Diode	277	1S750	270	351503
D2	Mixer	Silicon Signal Diode	277	1S750	270	351503
D3	Mixer	Silicon Signal Diode	277	1S750	270	351503
D4	Mixer	Silicon Signal Diode	277	1S750	270	351503
	Ferrite Beads					
FB1	Suppressor	Ferrite Tube		FX1242	78	203742
FB2	Filtering	Ferrite Tube		FX1483	78	342883
	Filter					
FL1	I.F. Filter	10.7MHz Crystal Filter	212	10M-2A	212	351506
	Inductors					
L1	Tuning	Can Assy	1		1	351237
L2	Coupling	Coil	1		1	351235
L3	Tuning	Can Assy	1		1	351238
L4	Tuning	Can Assy	1		1	351238
L5	Coupling	Coil	1		1	351236
L6	Tuning	Can Assy	1		1	351239
L7	Coupling	Coil	1		1	351236
L8	Tuning	Can Assy	1		1	351237
	Resistors					
R1	Gate Bias	22K 5% Carbon Film		CR25	233	342908
R2	Gate Bias	3.3K 5% Carbon Film		CR25	233	342917
R3	Source Resistor	150 ohm 5% Carbon Film		CR25	233	342929
R4	Supply Decoupling	100 ohm 5% Carbon Film		CR25	233	342930
R5	Matching	5.6K 5% Metal Oxide		MR25	233	351265

Item	Circuit Function	Description	Manufacturer Code	Manufacturer Designation	Supplier Code	STC DP Number
	Resistors					
R3	Base Decoupling	2.2K 5% Carbon Film		CR25	233	342918
R4	Supply Decoupling	100 ohm 5% Carbon Film		CR25	233	342930
R5	Supply Decoupling	1K 5% Carbon Film		CR25	233	342921
R6	Base Bias	2.2K 5% Carbon Film		CR25	233	342918
	Transformer					
T1	TR1 Output	Can Assy	1		1	351240
	Transistors					
TR1	Doubler	NPN Silicon	186	2N2368	269	351525
TR2	Amplifier	NPN Silicon	186	2N2368	269	351525

6.4 **RECEIVER R.F. AMPLIFIER BOARD – HIGH BAND**
DP351150 (28-LMU-5A)
Refer to Fig. No.6

Item	Circuit Function	Description	Manufacturer Code	Manufacturer Designation	Supplier Code	STC DP Number
	Capacitors					
C1	Input Tuning	2-10pF Variable	271	C16.5640/ST/10	271	351334
C2	Input Tuning	2-10pF Variable	271	C16.5640/ST/10	271	351334
C3	Supply Decoupling	.001uF Ceramic	276	K2600/831	231	342938
C4	Bypass	.001uF Ceramic	276	K2600/831	231	342938
C5	Bypass	.001uF Ceramic	276	K2600/831	231	342938
C6	Tuning	2-10pF Variable	271	C16.5640/ST/10	271	351334
C7	Tuning	2-10pF Variable	271	C16.5640/ST/10	271	351334
C8	Tuning	2-10pF Variable	271	C16.5640/ST/10	271	351334
C9	Tuning	18pF, 2%, NPO Ceramic		2222-638-10189	233	351311
C10	Tuning	2-10pF Variable	271	C16.5640/ST/10	271	351334
C11	Coupling	220pF, 5%, NPO Ceramic		2222-638-58221	233	351303
C12	Coupling	220pF, 5%, NPO Ceramic		2222-638-58221	233	351303
C13	Tuning	2-20pF Variable		2222-809-05003	233	351333
C14	Supply Decoupling	.01uF Ceramic	276	K800011/801	231	342937
C15	Bypass	.01uF Ceramic	276	K800011/801	231	342937
C16	Bypass	.01uF Ceramic	276	K800011/801	231	342937
	Diodes					
D1	Mixer	Silicon Signal Diode	277	1S750	270	351503
D2	Mixer	Silicon Signal Diode	277	1S750	270	351503
D3	Mixer	Silicon Signal Diode	277	1S750	270	351503
D4	Mixer	Silicon Signal Diode	277	1S750	270	351503
	Ferrite Beads					
FB1	Suppressor	Ferrite Tube		FX1242	78	203742
FB2	Filtering	Ferrite Tube		FX1483	78	342883
	Filter					
FL1	I.F. Filter	10.7MHz Crystal Filter	212	10M-2A	212	351506

Item	Circuit Function	Description	Manufacturer Code	Manufacturer Designation	Supplier Code	STC DP Number
	Ferrite Beads					
FB1	Suppressor	Ferrite Tube		FX1483/A1	78	342883
FB2	Suppressor	Ferrite Tube		FX1483/A1	78	342883
	Filter					
FL1	Supply Filter	Filtercon F/I	280	CFT3000	231	351507
	Inductors					
L1	Tuning	Can Assy	1		1	342117
L2	Tuning	Can Assy	1		1	351212
L3	Coupling	Coil	1		1	351401
	Resistors					
R1	Input Matching	100 ohm 5% Carbon Film		CR25	233	342930
R2	Base Bias	6.8K 5% Carbon Film		CR25	233	342913
R3	Base Decoupling	2.2K 5% Carbon Film		CR25	233	342918
R4	Supply Decoupling	100 ohm 5% Carbon Film		CR25	233	342930
R5	Supply Decoupling	100 ohm 5% Carbon Film		CR25	233	342930
R6	Base Decoupling	2.2K 5% Carbon Film		CR25	233	342918
R7	Base Bias	6.8K 5% Carbon Film		CR25	233	342913
	Transformers					
T1	TR1 Output	Can Assy	1		1	351213
	Transistors					
TR1	Doubler	NPN Silicon	186	2N2368	269	351525
TR2	Doubler	NPN Silicon	186	2N2368	269	351525

6.6 RECEIVER I.F. BOARD

DP351140 (28-LMU-6A)

Refer to Fig No.7

Item	Circuit Function	Description	Manufacturer Code	Manufacturer Designation	Supplier Code	STC DP Number
	Capacitors					
C1	Not Used					
C2	Coupling	68pF 2% Ceramic		2222-638-10101	233	342957
C3	Bypass	0.1uF Ceramic		2222-342-45104	233	342955
C4	Bypass	0.1uF Ceramic		2222-342-45104	233	342955
C5	Bypass	0.1uF Ceramic		2222-342-45104	233	342955
C6	Bypass	0.1uF Ceramic		2222-342-45104	233	342955
C7	Tuning	100pF 2% Ceramic		2222-638-10101	233	342959
C8	Bypass	0.1uF Ceramic		2222-342-45104	233	342955
C9	Bypass	0.1uF Ceramic		2222-342-45104	233	342955
C10	Bypass	0.1uF Ceramic		2222-342-45104	233	342955
C11	Tuning	120pF 2% Ceramic		2222-638-10121	233	351302
C12	Coupling	4.7pF ±½pF Ceramic		2222-638-09478	233	351306
C13	Bypass	0.1uF Ceramic		2222-342-45104	233	342955
C14	Filtering	.001uF Ceramic	276	K2600/831	231	342938
C15	Not Used					

Item	Circuit Function	Description	Manufacturer Code	Manufacturer Designation	Supplier Code	STC DP Number
	Capacitors					
C9	L.P. Filter	270pF 10% Ceramic		2222-632-58271	233	342793
C10	Coupling	0.1uF 35V Tant.		43212 Tag	158	270794
C11	Filtering	.01uF Ceramic		2222-629-03103	233	342758
C12	Bypass	10uF 25V Tant.		43212 Tag	158	260444
C13	Feedback	1000pF 10% Ceramic		2222-630-03102	233	351347
C14	Bypass	4.7uF 25V Tant.		43212 Tag	158	260440
C15	Output Coupling	220uF Electro.		2222-023-15221	233	342796
C16	Bootstrap	4.7uF 25V Tant.		43212 Tag	158	260440
C17	Filtering	0.1uF 35V Tant.		43212 Tag	158	270794
C18	Coupling	470pF Ceramic		2222-630-03471	233	342794
C19	Coupling	0.1uF 35V Tant.		43212 Tag	158	270794
C20	Supply Bypass	10uF 25V Tant.		43212 Tag	158	260440
C21	Tuning	270pF Ceramic		2222-632-58271	233	342793
C22	Coupling	0.1uF 35V Tant.		43212 Tag	158	270794
C23	Bypass	0.33uF 35V Tant.		43212 Tag	158	260433
C24	Filtering	0.33uF 35V Tant.		43212 Tag	158	260433
C25	Filtering	0.33uF 35V Tant.		43212 Tag	158	260433
C26	Time Delay	10uF 25V Tant.		43212 Tag	158	260440
C27	Not Used					
C28	Supply Filtering	10uF 25V Tant.		43212 Tag	158	260440
	Diodes					
D1	Rectifier	Silicon	178	IN4148	178	346307
D2	Rectifier	Silicon	178	IN4148	178	346307
D3	Isolating	Silicon	178	IN4148	178	346307
	Ferrite Beads					
FB1	Suppressor	Ferrite Tube		FX3004	78	342882
FB2	Suppressor	Ferrite Tube		FX3004	78	342882
FB3	Suppressor	Ferrite Tube		FX3004	78	342882
FB4	Suppressor	Ferrite Tube		FX3004	78	342882
FB5	Filtering	Ferrite Tube		FX1483	78	342883
FB6	Filtering	Ferrite Tube		FX1483	78	342883
FB7	Suppressor	Ferrite Tube		FX1483	78	342883
	Inductor					
L1	Tuning	40mH Coil	1		1	351286
	Resistors					
R1	Base Bias	33K 5% Carbon Film		CR25	233	342906
R2	Base Bias	68K 5% Carbon Film		CR25	233	342903
R3	De-emphasis	15K 5% Carbon Film		CR25	233	342910
R4	Gain Adjustment	4.7K 20% Linear Pot	57	62H	57	351273
R5	Emitter Resistor	4.7K 5% Carbon Film		CR25	233	342916
R6	Base Bias	68K 5% Carbon Film		CR25	233	342903
R7	Not Used					
R8	Base Bias	12K 5% Carbon Film		CR25	233	342803
R9	Supply Decoupling	2.2K 5% Carbon Film		CR25	233	342918
R10	Collector Load	5.1K 5% Metal Glaze	17	RG½	17	342753

6.8 TRANSMITTER/RECEIVER OSCILLATOR BOARD - SINGLE CHANNEL

DP351110 (16-LMU-1A)

Refer to Fig. No.9

Item	Circuit Function	Description	Manufacturer Code	Manufacturer Designation	Supplier Code	STC DP Number
	Capacitors					
C1	Bypass	.01uF Ceramic	276	K800011/801	231	342937
C2	Bypass	.01uF Ceramic	276	K800011/801	231	342937
C3	Divider	5.6pF ±5pF Ceramic	276	NPO/861	231	342951
C4	Crystal Compensation	2-20pF Variable		2222-809-05003	233	351333
C5	Crystal Compensation	5.6pF ±.5pF Ceramic	276	NPO/861	231	342951
C6	Tuning	2-20pF Variable		2222-809-05003	233	351333
C7	Bypass	.01uF Ceramic	276	K800011/801	231	342937
C8	Bypass	.01uF Ceramic	276	K800011/801	231	342937
C9	Bypass	.01uF Ceramic	276	K800011/801	231	342937
C10	Bypass	.01uF Ceramic	276	K800011/801	231	342937
C11	Divider	5.6pF ±.5pF Ceramic	276	NPO/861	231	342951
C12	Crystal Compensation	2-20pF Variable		2222-809-05003	233	351333
C13	Crystal Compensation	5.6pF ±.5pF Ceramic	276	NPO/861	231	342951
C14	Tuning	2-20pF Variable		2222-809-05003	233	351333
C15	Bypass	.01uF Ceramic	276	K800011/801	231	342937
	Ferrite Beads					
FB1	Isolating	Ferrite Bead		FX1242	78	203742
FB2	Isolating	Ferrite Bead		FX1242	78	203742
FB3	Filtering	Ferrite Tube		FX1483	78	342883
FB4	Filtering	Ferrite Tube		FX1483	78	342883
	Inductors					
L1	Tuning	Can Assy	1		1	351221
L2	Crystal Compensation	Can Assy	1		1	342115
L3	Tuning	Can Assy	1		1	351214
L4	Crystal Compensation	Can Assy	1		1	342116
	Resistors					
R1	Base Bias	4.7K 5% Carbon Film		CR25	233	342916
R2	Base Bias	4.7K 5% Carbon Film		CR25	233	342916
R3	Emitter Resistor	1K 5% Carbon Film		CR25	233	342921
R4	Base Bias	1K 5% Carbon Film		CR25	233	342921
R5	Base Bias	470 ohm 5% Carbon Film		CR25	233	342924
R6	Emitter Resistor	330 ohm 5% Carbon Film		CR25	233	342926
R7	Base Bias	4.7K 5% Carbon Film		CR25	233	342916
R8	Base Bias	4.7K 5% Carbon Film		CR25	233	342916
R9	Emitter Resistor	1K 5% Carbon Film		CR25	233	342921
R10	Base Bias	820 ohm 5% Carbon Film		CR25	233	342922
R11	Base Bias	390 ohm 5% Carbon Film		CR25	233	342925
R12	Emitter Resistor	330ohm 5% Carbon Film		CR25	233	342926
R13	Damping	560ohm 5% Carbon Film		CR25	233	342833
R14	Damping	1K 5% Carbon Film		CR25	233	342921
	Transformers					
T1	Tx Amplifier Output	Ferrite Assy	1		1	351207
T2	Rx Amplifier Output	Ferrite Assy	1		1	351207

Item	Circuit Function	Description	Manufacturer Code	Manufacturer Designation	Supplier Code	STC DP Number
	Diodes					
D1 to D10	Not Used					
D11	Isolating	Silicon	178	IN4148	178	346307
D12 to D20	Not Used					
D21	Isolating	Silicon	178	IN4148	178	346307
D22 to D30	Not Used					
D31	Isolating	Silicon	178	IN4148	178	346307
D32 to D40	Not Used					
D41	Isolating	Silicon	178	IN4148	178	346307
D42 to D50	Not Used					
D51	Isolating	Silicon	178	IN4148	178	346307
D52 to D60	Not Used					
D61	Isolating	Silicon	178	IN4148	178	346307
D62 to D70	Not Used					
D71	Isolating	Silicon	178	IN4148	178	346307
D72 to D80	Not Used					
D81	Isolating	Silicon	178	IN4148	178	346307
D82 to D200	Not Used					
D201	Isolating	Silicon	178	IN4148	178	346307
D202 to D300	Not Used					
D301	Isolating	Silicon	178	IN4148	178	346307
D302 to D501	Not Used					
	Ferrite Beads					
FB1 to FB200	Not Used					
FB201	Isolating	Ferrite Tube		FX1483	78	342883
FB202 to FB300	Not Used					
FB301	Isolating	Ferrite Tube		FX1483	78	342883
	Inductors					
L1 to L10	Not Used					
L11	Crystal Compensation	Can Assy	1		1	342115
L12 to L20	Not Used					
L21	Crystal Compensation	Can Assy	1		1	342115
L22 to L30	Not Used					
L31	Crystal Compensation	Can Assy	1		1	342115
L32 to L40	Not Used					
L41	Crystal Compensation	Can Assy	1		1	342115
L42 to L50	Not Used					
L51	Crystal Compensation	Can Assy	1		1	342116
L52 to L60	Not Used					
L61	Crystal Compensation	Can Assy	1		1	342116
L62 to L70	Not Used					
L71	Crystal Compensation	Can Assy	1		1	342116
L72 to L80	Not Used					
L81	Crystal Compensation	Can Assy	1		1	342116
	Resistors					
R1	Base Bias	1.8K 5% Carbon Film		CR25	233	342834
R2	Base Bias	560 ohm 5% Carbon Film		CR25	233	342833
R3	Emitter Resistor	270 ohm 5% Carbon Film		CR25	233	342927
R4 to R10	Not Used					
R11	Diode Bias	100K 5% Carbon Film		CR25	233	342902

Item	Circuit Function	Description	Manufacturer Code	Manufacturer Designation	Supplier Code	STC DP Number
	Transformers					
T301	Oscillator Output	Ferrite Assy	1		1	342119
T302 to T400	Not Used					
T401	RX Output	Ferrite Assy	1		1	342114
	Transistors					
TR1	TX Amplifier	Silicon N.P.N.	1	2N918	1	260215
TR2	TX Oscillator	Silicon N.P.N.	1	2N918	1	260215
TR3	RX Oscillator	Silicon N.P.N.	1	2N918	1	260215
TR4	RX Amplifier	Silicon N.P.N.	1	2N918	1	260215

6.10 **TRANSMITTER/RECEIVER OSCILLATOR - EIGHT & TWELVE CHANNEL**
DP342126 (16-LMU-7A/E)
Refer to Fig. No.11

Item	Circuit Function	Description	Manufacturer Code	Manufacturer Designation	Supplier Code	STC DP Number
	Capacitors					
C1	Coupling	.01uF Ceramic	276	K800011/801	231	342937
C2	Bypass	.01uF Ceramic	276	K800011/801	231	342937
C3 to C10	Not Used					
C11	Crystal Compensation	2-22pF Variable		2222-808-00006	233	342852
C12	Bypass	.01uF Ceramic	276	K800011/801	233	342937
C13 to C20	Not Used					
C21	Crystal Compensation	2-22pF Variable		2222-808-00006	233	342852
C22	Bypass	.01uF Ceramic	276	K800011/801	231	342937
C23 to C30	Not Used					
C31	Crystal Compensation	2-22pF Variable		2222-808-00006	233	342852
C32	Bypass	.01uF Ceramic	276	K800011/801	231	342937
C33 to C40	Not Used					
C41	Crystal Compensation	2-22pF Variable		2222-808-00006	233	342852
C42	Bypass	.01uF Ceramic	276	K800011/801	231	342937
C43 to C50	Not Used					
C51	Crystal Compensation	2-22pF Variable		2222-808-00006	233	342852
C52	Bypass	.01uF Ceramic	276	K800011/801	231	342937
C53 to C60	Not Used					
C61	Crystal Compensation	2-22pF Variable		2222-808-00006	233	342852
C62	Bypass	.01uF Ceramic	276	K800011/801	231	342937
C63 to C70	Not Used					
C71	Crystal Compensation	2-22pF Variable		2222-808-00006	233	342852
C72	Bypass	.01uF Ceramic	276	K800011/801	231	342937
C73 to C80	Not Used					
C81	Crystal Compensation	2-22pF Variable		2222-808-00006	233	342852
C82	Bypass	.01uF Ceramic	276	K800011/801	231	342937
C83 to C90	Not Used					
	Note C91 to C122 Applicable to 12 channel only.					
C91	Crystal Compensation	2-22pF Variable		2222-808-00006	233	342852
C92	Bypass	.01uF Ceramic	276	K800011/801	231	342937
C93 to C100	Not Used					

Item	Circuit Function	Description	Manufacturer Code	Manufacturer Designation	Supplier Code	STC DP Number
	Diodes					
D301	Isolating	Silicon	178	1N4148	178	346307
D302 to D400	Not Used					
	Note D401 applicable to 12 channel only					
D401	Isolating	Silicon	178	1N4148	178	346307
	Ferrite Beads					
FB1 to FB200	Not Used					
FB201	Isolating	Ferrite Bead		FX1483	78	342883
FB202 to FB300	Not Used					
FB301	Isolating	Ferrite Bead		FX1483	78	342883
FB302 to FB400	Not Used					
	Note FB401 applicable to 12 channel only					
FB401	Isolating	Ferrite Bead		FX1483	78	342883
	Inductors					
	8 and 12 channel Transmitter Oscillator					
L1 to L10	Not Used					
L11	Crystal Compensation	Can Assy	1		1	342115
L12 to L20	Not Used					
L21	Crystal Compensation	Can Assy	1		1	342115
L22 to L30	Not Used					
L31	Crystal Compensation	Can Assy	1		1	342115
L32 to L40	Not Used					
L41	Crystal Compensation	Can Assy	1		1	342115
L42 to L50	Not Used					
L51	Crystal Compensation	Can Assy	1		1	342115
L52 to L60	Not Used					
L61	Crystal Compensation	Can Assy	1		1	342115
L62 to L70	Not Used					
L71	Crystal Compensation	Can Assy	1		1	342115
L72 to L80	Not Used					
L81	Crystal Compensation	Can Assy	1		1	342115
L82 to L90	Not Used					
	Note L91 to L121 applicable to 12 channel only					
L91	Crystal Compensation	Can Assy	1		1	342115
L92 to L100	Not Used					
L101	Crystal Compensation	Can Assy	1		1	342115
L102 to L110	Not Used					
L111	Crystal Compensation	Can Assy	1		1	342115
L112 to L120	Not Used					
L121	Crystal Compensation	Can Assy	1		1	342115
	8 and 12 channel Receiver Oscillator					
L1 to L10	Not Used					
L11	Crystal Compensation	Can Assy	1		1	342116
L12 to L20	Not Used					
L21	Crystal Compensation	Can Assy	1		1	342116
L22 to L30	Not Used					
L31	Crystal Compensation	Can Assy	1		1	342116

Item	Circuit Function	Description	Manufacturer Code	Manufacturer Designation	Supplier Code	STC DP Number
	Resistors					
R32	Isolating	330 ohm 5% Carbon Film		CR25	233	342926
R33	Damper	1K 5% Carbon Film		CR25	233	342921
R34 to R40	Not Used					
R41	Diode Bias	100K 5% Carbon Film		CR25	233	342902
R42	Isolating	330 ohm 5% Carbon Film		CR25	233	342926
R43	Damper	1K 5% Carbon Film		CR25	233	342921
R44 to R50	Not Used					
R51	Diode Bias	100K 5% Carbon Film		CR25	233	342902
R52	Isolating	330 ohm 5% Carbon Film		CR25	233	342926
R53	Damper	1K 5% Carbon Film		CR25	233	342921
R54 to R60	Not Used					
R61	Diode Bias	100K 5% Carbon Film		CR25	233	342902
R62	Isolating	330 ohm 5% Carbon Film		CR25	233	342926
R63	Damper	1K 5% Carbon Film		CR25	233	342921
R64 to R70	Not Used					
R71	Diode Bias	100K 5% Carbon Film		CR25	233	342902
R72	Isolating	330 ohm 5% Carbon Film		CR25	233	342926
R73	Damper	1K 5% Carbon Film		CR25	233	342921
R74 to R80	Not Used					
R81	Diode Bias	100K 5% Carbon Film		CR25	233	342902
R82	Isolating	330 ohm 5% Carbon Film		CR25	233	342926
R83	Damper	1K 5% Carbon Film		CR25	233	342921
R84 to R90	Not Used					
	Note R91 to R121 applicable to 12 channel only					
R91	Diode Bias	100K 5% Carbon Film		CR25	233	342902
R92	Isolating	330 ohm 5% Carbon Film		CR25	233	342926
R93	Damper	1K 5% Carbon Film		CR25	233	342921
R94 to R100	Not Used					
R101	Diode Bias	100K 5% Carbon Film		CR25	233	342902
R102	Isolating	330 ohm 5% Carbon Film		CR25	233	342926
R103	Damper	1K 5% Carbon Film		CR25	233	342921
R104 to R110	Not Used					
R111	Diode Bias	100K 5% Carbon Film		CR25	233	342902
R112	Isolating	330 ohm 5% Carbon Film		CR25	233	342926
R113	Damper	1K 5% Carbon Film		CR25	233	342921
R114 to R120	Not Used					
R121	Diode Bias	100K 5% Carbon Film		CR25	233	342902
R122	Isolating	330 ohm 5% Carbon Film		CR25	233	342926
R123	Damper	1K 5% Carbon Film		CR25	233	342921
R124 to R200	Not Used					
R201	Base Bias	4.7K 5% Carbon Film		CR25	233	342916
R202	Base Bia	4.7K 5% Carbon Film		CR25	233	342916
R203	Damper	1K 5% Carbon Film		CR25	233	342921
R204	Supply Decoupling	47 ohm 5% Carbon Film		CR25	233	342932
R205	Output Matching	1.5K 5% Carbon Film		CR25	233	342919
R206 to R300	Not Used					
R301	Base Bias	4.7K 5% Carbon Film		CR25	233	342916
R302	Base Bias	4.7K 5% Carbon Film		CR25	233	342916
R303	Damper	1K 5% Carbon Film		CR25	233	342921
R304	Supply Decoupling	47 ohm 5% Carbon Film		CR25	233	342932
R305	Output Matching	1.5K 5% Carbon Film		CR25	233	342919

Item	Circuit Function	Description	Manufacturer Code	Manufacturer Designation	Supplier Code	STC DP Number
	Capacitors					
C9	De-emphasis	0.22uF 10% Polyester		PMP0.22-K100	158	351325
C10	Bypass	33uF 25V Tant.		43212 Tag	158	260449
C11	LP Filter	680pF 2.5% 63V Polyester	182	HS	182	351323
C12	LP Filter	.01uF 5% Polycarbonate		PMA0.01-J100	158	299085
C13	LP Filter	.01uF 5% Polycarbonate		PMA0.01-J100	158	299085
C14	LP Filter	.01uF 5% Polycarbonate		PMA0.01-J100	158	299085
C15	Output Coupling	10uF 25V Tant.		43212 Tag	158	351328
C16	Filtering	.01uF Ceramic	276	K800011/801	231	342937
C17	Pre-emphasis	.001uF Ceramic		K2600/831	231	342938
C18	Bypass	33uF 25V Tant.		43212 Tag	158	260499
	Ferrite Beads					
FB1	Suppressor	Ferrite Tube		FX3004	78	342882
FB2	Suppressor	Ferrite Tube		FX3004	78	342882
FB3	Suppressor	Ferrite Tube		FX3004	78	342882
FB4	Suppressor	Ferrite Tube		FX3004	78	342882
FB5	Filtering	Ferrite Tube		FX3004	78	342882
	Integrated Circuit					
IC1	Limiting Amp	IC Linear Amplifier		TAA263	78	342982
	Resistors					
R1	Microphone Adj	470 ohm 20% Pot	57	62H	57	342885
R2	Biasing	47K 5% Carbon Film		CR25	233	342904
R3	Biasing	22K 5% Carbon Film		CR25	233	342908
R4	Collector Load	2.2K 5% Carbon Film		CR25	233	342918
R5	Emitter Resistor	47 ohm 5% Carbon Film		CR25	233	342932
R6	Emitter Resistor	1.5K 5% Carbon Film		CR25	233	342919
R7	Supply Decoupling	680 ohm 5% Carbon Film		CR25	233	342923
R8	D.C. Feedback	2.2M 10% Carbon Film		CR25	233	351256
R9	Supply Decoupling	330 ohm 5% Carbon Film		CR25	233	342926
R10	Collector Load	330 ohm 5% Carbon Film		CR25	233	342926
R11	Emitter Resistor	10K 5% Carbon Film		CR25	233	342911
R12	Biasing	8.2K 2% Metal Oxide		MR25	233	351267
R13	Biasing	6.8K 2% Metal Oxide		MR25	233	351266
R14	De-emphasis	22K 5% Carbon Film		CR25	233	342908
R15	Collector Load	3.3K 5% Carbon Film		CR25	233	342917
R16	Emitter Resistor	220 ohm 5% Carbon Film		CR25	233	342928
R17	Emitter Resistor	3.3K 5% Carbon Film		CR25	233	342917
R18	LP Filter	12K 2% Metal Oxide		MR25	233	351268
R19	LP Filter	15K 2% Metal Oxide		MR25	233	342889
R20	Emitter Resistor	3.3K 5% Carbon Film		CR25	233	342917
R21	LP Filter	4.7K 2% Metal Oxide		MR25	233	351263
R22	LP Filter	4.7K 2% Metal Oxide		MR25	233	351263
R23	Deviation Adj	470 ohm 20% Pot	57	62H	57	342885
R24	Not Used					
R25	Not Used					
R26	Output Padding	1K 5% Carbon Film		CR25	233	342893
R27	Supply Decoupling	1.5K 5% Carbon Film		CR25	233	342919

Item	Circuit Function	Description	Manufacturer Code	Manufacturer Designation	Supplier Code	STC DP Number
	Diodes					
D1	Modulating	PIN Diode	86	HP5082-3080	86	342993
D2	Modulating	PIN Diode	86	HP5082-3080	86	342993
D3	Modulating	PIN Diode	86	HP5082-3080	86	342993
D4	Biasing	Silicon Diode	178	IN4148	178	346307
	Ferrite Beads					
FB1	Filtering	Ferrite Bead		FX3004	78	342882
FB2	Suppressor	Ferrite Tube		FX1483	78	342883
	Inductors					
L1	R.F. Decoupling	22uH		58-10.0013-10	131	351206
L2	Phase Shifting	1.5uH		58-10.0006-10	131	351202
L3	R.F. Decoupling	22uH		58-10.0013-10	131	351206
L4	R.F. Decoupling	22uH		58-10.0013-10	131	351206
L5	R.F. Decoupling	22uH		58-10.0013-10	131	351206
L6	Tuning	Can Assy	1		1	351243
L7	Filter	Can Assy	1		1	351244
	Resistors					
R1	Terminating	47 ohm 5% Carbon Film		CR25	233	342932
R2	Base Bias	6.8K 5% Carbon Film		CR25	233	342913
R3	Base Bias	3.3K 5% Carbon Film		CR25	233	342917
R4	Supply Decoupling	100 ohm 5% Carbon Film		CR25	233	342930
R5	Collector Load	120 ohm 5% Carbon Film		CR25	233	351254
R6	Emitter Resistor	100 ohm 5% Carbon Film		CR25	233	342930
R7	DI Bias	33K 2% Metal Oxide		MR25	233	351270
R8	Matching	100 ohm 5% Carbon Film		CR25	233	342930
R9	Base Bias	6.8K 5% Carbon Film		CR25	233	342913
R10	Base Bias	3.3K 5% Carbon Film		CR25	233	342917
R11	Supply Decoupling	100 ohm 5% Carbon Film		CR25	233	342930
R12	Collector Load	120 ohm 5% Carbon Film		CR25	233	351254
R13	Emitter Resistor	100 ohm 5% Carbon Film		CR25	233	342930
R14	Terminating	180 ohm 5% Carbon Film		CR25	233	351255
R15	D2 Bias	33K 2% Metal Oxide		MR25	233	351270
R16	Matching	100 ohm 5% Carbon Film		CR25	233	342930
R17	Base Bias	6.8K 5% Carbon Film		CR25	233	342913
R18	Base Bias	3.3K 5% Carbon Film		CR25	233	342917
R19	Supply Decoupling	100 ohm 5% Carbon Film		CR25	233	342930
R20	Collector Load	120 ohm 5% Carbon Film		CR25	233	351254
R21	Emitter Resistor	100 ohm 5% Carbon Film		CR25	233	342930
R22	D3 Bias	33K 2% Metal Oxide		MR25	233	351270
R23	Base Bias	10K 5% Carbon Film		CR25	233	342911
R24	Base Bias	4.7K 5% Carbon Film		CR25	233	342916
R25	Emitter Resistor	470 ohm 5% Carbon Film		CR25	233	342924
R26	Not Used					
R27	Not Used					
R28	Supply Decoupling	100 ohm 5% Carbon Film		CR25	233	342930
R29	Emitter Resistor	150 ohm 5% Carbon Film		CR25	233	342929
R30	Base Bias	10K 5% Carbon Film		CR25	233	342911
R31	Base Decoupling	470 ohm 5% Carbon Film		CR25	233	342924

Item	Circuit Function	Description	Manufacturer Code	Manufacturer Designation	Supplier Code	STC DP Number
	Capacitors					
C23	Coupling	15pF 10% Ceramic	276	NPO/YD	231	351310
C24	Coupling	1.5pF 0.1% Ceramic	276	AP	231	351300
C25	Tuning	2-20pF Variable		2222-809-05003	233	351333
C26	Bypass	.001uF Ceramic	276	K2600/831	231	342938
C27	Bypass	.001uF Ceramic	276	K2600/831	231	342938
C28	Tuning	2.2pF 0.5pF Ceramic	276	P100/YD	231	351305
C29	Tuning	2-20pF Variable		2222-809-05003	233	351333
C30	Coupling	.001uF Ceramic	276	K2600/831	231	342938
C31	Tuning	15pF 10% Ceramic	276	NPO/YD	231	351310
C32	Tuning	2-20pF Variable		2222-809-05003	233	351333
C33	Coupling	2pF 0.1% Ceramic	276	AP	231	351301
C34	Supply Decoupling	.001uF Ceramic	276	K2600/831	231	342938
C35	Tuning	6.8pF 10% Ceramic	276	P100/YD	231	351307
C36	Tuning	2-20pF Variable		2222-809-05003	233	351333
C37	Bypass	.001uF Ceramic	276	K2600/831	231	342938
C38	Coupling	.001uF Ceramic	276	K2600/831	231	342938
C39	Matching	47pF 10% Ceramic	276	N750/YD	231	342936
C40	Bypass	.01uF Ceramic	276	K800011/801	231	342937
C41	Phasing	22pF 5% Ceramic	276	NPO/YD	231	351313
	Diodes					
D1	Modulating	PIN Diode	86	HP5082-3080	86	342993
D2	Bias	Silicon Diode	178	IN4148	178	346307
D3	Modulating	PIN Diode	86	HP3082-3080	86	342993
	Ferrite Beads					
FB1	R.F. Decoupling	Ferrite Bead		FX3004	78	342882
FB2	Filtering	Ferrite Bead		FX3004	78	342882
FB3	Suppressor	Ferrite Tube		FX1483	78	342883
	Inductors					
L1	Phase Shifting	1.5uH		58-10-0006-10	131	351202
L2	Tuning	Can Assy	1		1	351215
L3	R.F. Decoupling	22uH	274	102552	274	351205
L4	Not Used					
L5	R.F. Decoupling	22uH		58-10-0013-10	131	351206
L6	Supply Decoupling	1uH		58-10-0005-10	131	351201
L7	Bias	1uH	274	1025-20	274	351201
L8	Tuning	Can Assy	1		1	351218
L9	R.F. Decoupling	22uH	274	102552	274	351205
L10	R.F. Decoupling	22uH	274	102552	274	351205
	Resistors					
R1	Base Bias	6.8K 5% Carbon Film		CR25	233	342913
R2	Supply Decoupling	100 ohm 5% Carbon Film		CR25	233	342930
R3	Collector Load	120 ohm 5% Carbon Film		CR25	233	351254
R4	Emitter Resistor	100 ohm 5% Carbon Film		CR25	233	342930
R5	Terminating	100 ohm 5% Carbon Film		CR25	233	342930
R6	D1 Bias	33K 2% Metal Oxide		MR25	233	351270
R7	Matching	470 ohm 5% Carbon Film		CR25	233	342924

6.14 POWER AMPLIFIER 10W - LOW BAND
DP351637 (28-LMU-14D)
Refer to Fig. No.15

Item	Circuit Function	Description	Manufacturer Code	Manufacturer Designation	Supplier Code	STC DP Number
	Capacitors					
C1	Input Coupling	15pF 5% Ceramic	276	NPO/831	231	351341
C2	Matching	5-65pf Variable		2222-808-01001	233	351332
C3	H.F. Bypass	.01uf Ceramic	276	K800011/801	231	342937
C4	L.F. Bypass	10uF 25V Tant.		43212 Tag	158	351328
C5	Coupling	56pF 5% Ceramic	276	N750/801	231	351344
C6	Tuning	5-65pf Variable		2222-808-01001	233	351332
C7	Tuning	50pF 5% Ceramic	276	N750/801	231	351343
C8	H.F. Bypass	.01uf Ceramic	276	K800011/801	231	342937
C9	Matching	5-65pf Variable		2222-808-01001	233	351332
C10	Matching	5-65pf Variable		2222-808-01001	233	351332
C11	Tuning	20pF 5% Ceramic	276	NPO/801	231	351312
C12	L.F. Bypass	10uF 25V Tant.		43212 Tag	158	351328
C13	Matching	47pF 5% Ceramic	276	N470/801	231	351337
C14	Matching	33pF 5% Ceramic	276	N150/801	231	351315
C15	Bypass	.001uf Ceramic	276	K2600/831	231	342938
C16	Filter	33pF 5% Ceramic	276	N150/801	231	351315
C17	Filter	47pF 5% Ceramic	276	N470/801	231	351337
C18	Filter	47pF 5% Ceramic	276	N470/801	231	351337
C19	Filter	20pF 5% Ceramic	276	NPO/801	231	351312
C20 to C24	Not Used					
C25	D.C. Blocking	.001uf Ceramic	276	K2600/831	231	342938
C26 to C27	Not Used					
C28	Bypass	.01uF Ceramic	276	K800011/801	231	342937
C29	Not Used					
C30	Filtering	.01uF Ceramic	276	K800011/801	231	342937
C31	Filtering	.01uF Ceramic	276	K800011/801	231	342937
C32	Filtering	.01uF Ceramic	276	K800011/801	231	342937
C33	Filtering	.01uF Ceramic	276	K800011/801	231	342937
C34	Bypass	.001uF Ceramic	276	K2600/831	231	342938
C35	Tuning	330pF 10% Ceramic	276	K120051/831	231	351338
C36	Coupling	.001uF Ceramic	276	K2600/831	231	342938
C37	Bypass	0.1uF 10% Poly.		2222-342-45104	233	342955
C38	Bypass	0.1uF 10% Poly.		2222-342-45104	233	342955
C39	Filtering	0.1uF 10% Poly.		2222-342-45104	233	342955
	Diodes					
D1	RX Switch	Silicon		BA244	233	351501
D2	TX Switch	Silicon		BA244	233	351501
D3	Switch	Silicon		BA244	233	351501
D4	Switch	Silicon		BA244	233	351501
D5	TX Switch	Silicon		BA244	233	351501
D6	Aerial Switch	Silicon	178	IN4148	178	346307
D7	Bias	Silicon	178	IN4148	178	346307
D8	Bias	Silicon	178	IN4148	178	346307

6.15 POWER AMPLIFIER 25W - LOW BAND
DP351634 (28-LMU-148)
Refer to Fig. No.16

Item	Circuit Function	Description	Manufacturer Code	Manufacturer Designation	Supplier Code	STC DP Number
	Capacitors					
C1	Input Matching	1-3pf Variable		2222-809-05001	233	351618
C2	Tuning	39pF 5% Ceramic	276	N220/801	231	351339
C3	Supply Decoupling	.01uF Ceramic	276	K800011/801	231	342937
C4	Bypass	.01uF Ceramic	276	K800011/801	231	342937
C5	Tuning	5-65pF Variable		2222-808-01001	233	351332
C6	Coupling	.001uF Ceramic	276	K2600/831	231	342938
C7	L.F. Bypass	10uF 25V Tant.		43212 Tag	158	260444
C8	H.F. Bypass	.001uF Ceramic	276	K2600/831	231	342938
C9	Tuning	5-65pF Variable		2222-808-01001	233	351332
C10	Coupling	220pF 10% Ceramic	276	K120051/831	231	351340
C11	Matching	220pF 10% Ceramic	276	K120051/831	231	351340
C12	Matching	220pF 10% Ceramic	276	K120051/831	231	351340
C13	L.F. Bypass	10uF 25V Tant.		43212 Tag	158	260444
C14	Not Used					
C15	Bypass	.001uF Ceramic	276	K2600/831	231	342938
C16	Filter	33pF 5% Ceramic	276	N150/801	231	351315
C17	Filter	47pF 5% Ceramic	276	N470/801	231	351337
C18	Filter	47pF 5% Ceramic	276	N470/801	231	351337
C19	Filter	20pF 5% Ceramic	276	NP0/801	231	351312
C20	Bypass	.001uF Ceramic	276	K2600/831	231	342938
C21	H.F. Bypass	.001uF Ceramic	276	K2600/831	231	342938
C22	Tuning	5-65pF Variable		2222-808-01001	233	351332
C23	Tuning	33pF 5% Ceramic	276	N150/801	231	351315
C24	Matching	5-65pF Variable		2222-808-01001	233	351332
C25	Coupling	.001uF Ceramic	276	K2600/831	231	342938
C26	Not Used					
C27	Suppressor	.001uF Ceramic	276	K2600/831	231	342938
C28	Bypass	.01uF Ceramic	276	K800011/801	231	342937
C29	Not Used					
C30	Filtering	.01uF Ceramic	276	K800011/801	231	342937
C31	Filtering	.01uF Ceramic	276	K800011/801	231	342937
C32	Filtering	.01uF Ceramic	276	K800011/801	231	342937
C33	Filtering	.01uF Ceramic	276	K800011/801	231	342937
C34	Bypass	.001uF Ceramic	276	K2600/831	231	342938
C35	Tuning	330pF 10% Ceramic	276	K120051/831	231	351338
C36	Coupling	.001uF Ceramic	276	K2600/831	231	342938
C37	Bypass	0.1uF 10% Polycarbonate		2222-342-45104	233	342955
C38	Bypass	0.1uF 10% Polycarbonate		2222-342-45104	233	342955
C39	Bypass	0.1uF 10% Polycarbonate		2222-342-45104	233	342955
C40	Bypass	.01uF Ceramic	276	K800011/801	231	342937
C41	Bypass	.01uF Ceramic	276	K800011/801	231	342937
	Diodes					
D1	RX Switch	Silicon		BA244	233	351501
D2	TX Switch	Silicon		BA244	233	351501
D3	Switch	Silicon		BA244	233	351501
D4	Switch	Silicon		BA244	233	351501

Item	Circuit Function	Description	Manufacturer Code	Manufacturer Designation	Supplier Code	STC DP Number
	Thermistor					
TH1	Temperature Regulator			YC.080TB	158	351509
	Transistors					
TR1	Input Amplifier	Silicon N.P.N.	186	2N4427	269	342995
TR2	Amplifier	Silicon N.P.N.	186	2N6080	269	351531
TR3	Output Amplifier	Silicon N.P.N.	186	2N6083	269	351518
TR4	Supply Regulator	Silicon N.P.N.	186	MJE370	269	342980

6.16 POWER AMPLIFIER 10W - HIGH BAND
DP351629 (28-LMU-14C)
Refer to Fig. No.17

Item	Circuit Function	Description	Manufacturer Code	Manufacturer Designation	Supplier Code	STC DP Number
	Capacitors					
C1	Input Matching	5-65pF Variable		2222-808-01001	233	351332
C2	Coupling	.001uF Ceramic	276	K2600/831	231	342938
C3	H.F. Bypass	.001uF Ceramic	276	K2600/831	231	342938
C4	L.F. Bypass	4.7uf 25V Tant.		43212 Tag	158	260440
C5	Coupling	15pF 5% Ceramic	276	NP0/831	231	351341
C6	Tuning	5-65pF Variable		2222-808-01001	233	351332
C7	H.F. Bypass	.001uF Ceramic	276	K2600/831	231	342938
C8	L.F. Bypass	4.7uf 25V Tant.		43212 Tag	158	260440
C9	Output Matching	2-20pF Variable		2222-809-05003	233	351333
C10	Output Matching	5-65pF Variable		2222-808-01001	233	351332
C11	Matching	82pF 2% Ceramic		2222-632-34829	233	351317
C12 to C19	Not Used					
C20	Bypass	.001uF Ceramic	276	K2600/831	231	342938
C21	Bypass	.001uF Ceramic	276	K2600/831	231	342938
C22	Filter	20pF 5% Ceramic	276	NP0/801	231	351312
C23	Filter	33pF 5% Ceramic	276	N150/801	231	351315
C24	Filter	33pF 5% Ceramic	276	N150/801	231	351315
C25	Filter	20pF 5% Ceramic	276	NP0/801	231	351312
C26	Coupling	.001uF Ceramic	276	K2600/831	231	342938
C27	Tuning	82pF 2% Ceramic		2222-632-34829	233	351317
C28	Tuning	5-65pF Variable		2222-808-01001	233	351332
C29	Bypass	.001uF Ceramic	276	K2600/831	231	342938
C30	Bypass	.1uF 10% Polycarbonate		2222-342-45104	233	342955
C31	Not Used					
C32	Filtering	.01uF Ceramic	276	K800011/801	231	342937
C33	Filtering	.01uF Ceramic	276	K800011/801	231	342937
C34	Filtering	.01uF Ceramic	276	K800011/801	231	342937
C35	Filtering	.001uF Ceramic	276	K2600/831	231	342938
C36	Filtering	.001uF Ceramic	276	K2600/831	231	342938
C37	Coupling	.001uF Ceramic	276	K2600/831	231	342938
	Diodes					
D1	Base Bias	Silicon	178	1N4148	178	346307
D2	Not Used					

Item	Circuit Function	Description	Manufacturer Code	Manufacturer Designation	Supplier Code	STC DP Number
	Capacitors					
C11	H.F. Bypass	.001uf Ceramic	276	K2600/831	231	342938
C12	L.F. Bypass	1uF 35V Tant.		43212 Tag	158	260962
C13	Coupling	27pF ± .5pF Ceramic	276	N080/81	231	342942
C14	Tuning	5-65pF Variable		2222-808-01001	233	351332
C15	Matching	68pF 5% Ceramic	276	N750/A	231	351316
C16	H.F. Bypass	.001uf Ceramic	276	K2600/831	231	342938
C17	H.F. Bypass	.001uf Ceramic	276	K2600/831	231	342938
C18	Output Matching	2-20pf Variable		2222-638-58221	233	351333
C19	Output Matching	2-20pF Variable		2222-638-58221	233	351333
C20	Bypass	.001uF Ceramic	276	K2600/831	231	342938
C21	Bypass	.001uf Ceramic	276	K2600/831	231	342938
C22	Filter	20pF 5% Ceramic	276	NPO/801	231	351312
C23	Filter	33pF 5% Ceramic	276	N150/801	231	351315
C24	Filter	33pF 5% Ceramic	276	N150/801	231	351315
C25	Filter	20pF 5% Ceramic	276	NPO/801	231	351312
C26	Coupling	.001uF Ceramic	276	K2600/831	231	342938
C27	Tuning	82pF 2% Ceramic		2222-632-34829	233	351317
C28	Tuning	5-65pF Variable		2222-808-01001	233	351332
C29	Supply Filtering	.001uf Ceramic	276	K2600/831	231	342938
C30	Bypass	0.1uf 10% Polycarbonate		2222-342-45104	233	342955
C31	Not Used					
C32	Filtering	.01uF Ceramic	276	K800011/801	231	342937
C33	Filtering	.01uF Ceramic	276	K800011/801	231	342937
C34	Filtering	.01uF Ceramic	276	K800011/801	231	342937
C35	Filtering	.001uf Ceramic	276	K2600/831	231	342938
C36	Bypass	.001uF Ceramic	276	K2600/831	231	342938
C37	Coupling	.001uF Ceramic	276	K2600/831	231	342938
C38	Bypass	.01uF Ceramic	276	K800011/801	231	342937
	Diodes					
D1	Not Used					
D2	Base Bias	Silicon	178	IN4148	178	346307
D3	TX Switch	Silicon		BA244	24	351501
D4	TX Switch	Silicon		BA244	24	351501
D5	Switch	Silicon		BA244	24	351501
	Ferrite Beads					
FB1	Suppressor	Ferrite Tube		FX1483	78	342883
FB2	Filtering	Ferrite Bead		FX1242	78	203742
FB3	Filtering	Ferrite Bead		FX1242	78	203742
	Inductors					
L1	Base Choke	Ferrite Coil	1		1	351219
L2	Base Choke	Ferrite Coil	1		1	351219
L3	Supply Decoupling	1uH		58-10-0076-10	131	351200
L4	Filter	Coil	1		1	351233
L5	Filter	Coil	1		1	351233
L6	Filter	Coil	1		1	351233
L7	Supply Decoupling	1uH		58-10-0076-10	131	351200
L8	Static Discharge	1uH		58-10-0005-10	131	351201

Item	Circuit Function	Description	Manufacturer Code	Manufacturer Designation	Supplier Code	STC DP Number
	Resistors					
R7	TR4 Base Bias	1.5K 5% Carbon Film		CR25	233	342919
R8	TR5 Base Bias	330 ohm 2% Metal Oxide		MR25	233	351260
R9	TR5 Base Bias	120 ohm 2% Metal Oxide		MR25	233	351259
R10	TR5 Base Bias	56 ohm 2% Metal Oxide		MR25	233	351258
R11	TR3 Base Bias	3.3K 2% Metal Oxide		MR25	233	351262
R12	Current Limit	680 ohm 5% Carbon Film		CR25	233	342923
R13	Current Limit	100K 5% Carbon Film		CR25	233	342902
	Transistors					
TR1	Regulator	Silicon P.N.P.	186	MJE370	269	342980
TR2	TR1 Base Drive	Silicon N.P.N.	158	BC107A	158	299722
TR3	Voltage Sensing	Silicon N.P.N.	158	BC107A	158	299722
TR4	TX Switch	Silicon P.N.P.	186	2N5221	269	342979
TR5	RX Switch	Silicon P.N.P.	186	2N5221	269	342979
TR6	P.T.T. Switch	Silicon N.P.N.	186	2N5220	269	351521

6.19 MISCELLANEOUS (SHOWN ON INTERCONNEXION DIAGRAMS)
Refer to Fig. No.20 to Fig. No. 25

Item	Circuit Function	Description	Manufacturer Code	Manufacturer Designation	Supplier Code	STC DP Number
	Capacitors					
C1	Supply Filtering	400uF 25V Elect.		2222-023-16401	233	256697
C2	+9V Filtering	100uF 16V Elect.	155	T100	182	342976
C3	Suppressor	.01uF Ceramic		K800011/801	231	342937
C4	Suppressor	.01uF Ceramic		K800011/801	231	342937
	Diode					
D1	Polarity Protection	Silicon Power	158	IN4997R	158	342999
	Ferrite Beads					
FB1	Suppressor	Ferrite Tube		FX1483	78	342883
FB2	Suppressor	Ferrite Tube		FX1483	78	342883
FB3	Suppressor	Ferrite Tube		FX1483	78	342883
FB4	Suppressor	Ferrite Tube		FX1483	78	342883
FB5 to FB9	Applicable to 8 and 12 Channel Only					
FB5	Suppressor	Ferrite Tube		FX1483	78	342883
FB6	Suppressor	Ferrite Tube		FX1483	78	342883
FB7	Suppressor	Ferrite Tube		FX1483	78	342883
FB8	Suppressor	Ferrite Tube		FX1483	78	342883
FB9	Suppressor	Ferrite Tube		FX1483	78	342883
	Filter					
FL1	Filtering	Filtercon F/T	280	CTF3000	231	351507
FL2	Filtering	Filtercon F/T	280	CTF3000	231	351507
FL3	Filtering	Filtercon F/T	280	CTF3000	231	351507
FL4	Filtering	Filtercon F/T	280	CTF3000	231	351507

Item	Circuit Function	Description	Manufacturer Code	Manufacturer Designation	Supplier Code	STC DP Number
	Inductors					
L1	Supply Filter	Torroidal Coil	1		1	351220
	Lamps					
LP1	Supply ON	L.E.D.	279	Roden SL103	14	342809
LP2	TX ON	L.E.D.	279	Roden SL103	14	342809
LP3	Applicable to Multi Channel Only					
LP3	Channel	12V 55mA	279	Roden RM3	14	342806
	Resistors					
R1	Volume Control	4.7K Log Pot 20%	1		1	342844
R?	Internal Muting Only (Preset)					
	Muting Control	200K Lin Pot 30%		VP200	17	351278
R2	External Muting Only (Adjustable)					
	Muting Control	200K Pot 30%	1		1	351656
R3	Lamp Supply	470 ohm 5% Carbon Film		CR25	233	342924
R4	Applicable to Multi Channel Only					
R4	Lamp Supply	100 ohm 5% Carbon Film		CR25	233	259842
R5	Lamp Supply	470 ohm 5% Carbon Film		CR25	233	342924
	Switch					
S1	Supply Switch	DPDT	281	J1-7201	14	342810
S?	Applicable to Multi Channel Only					
S2	Channel Selector	1 Pole 12 Position	1		1	342843
	Microphone Pencil					
MC1	Microphone		1		1	342200
	Microphone Heavy Duty					
MC1	Microphone		1		1	351677

Item	Circuit Function	Description	Manufacturer Code	Manufacturer Designation	Supplier Code	STC DP Number
	Resistors					
R1	Base Bias	Select on Test		CR25	233	
R2	Base Bias	1.5K 5% Carbon Film		CR25	233	342919
R3	Base Bias	680 ohm 5% Carbon Film		CR25	233	342923
R4	Damper	100 ohm 5% Carbon Film		CR25	233	342930
R5	Base Bias	1K 5% Carbon Film		CR25	233	342921
R6	Base Bias	22 ohm 5% Carbon Film		CR25	233	342933
R7	Base Bias	33 ohm 5% Carbon Film		CR25	233	342896
R8	Not Used					
R9	Damper	56 ohm 5% Carbon Film		CR25	233	342777
R10	Not Used					
R11	Damper	100 ohm 5% Carbon Film		CR25	233	342930
R12	Bias	100K 5% Carbon Film		CR25	233	342902
R13	Current Limit	180 ohm 5% Carbon Film		CR25	233	351255
R14	Bias	100K 5% Carbon Film		CR25	233	342902
	Thermistor					
TH1	Temperature Regulator			YC.808.TB	158	351509
	Transistors					
TR1	Input Amplifier	Silicon N.P.N.	186	MRF606	269	351515
TR2	Amplifier	Silicon N.P.N.	186	2N6081	269	351517
TR3	Output Amplifier	Silicon N.P.N.	186	2N6083	269	351518
TR4	Supply Regulator	Silicon P.N.P.	186	MPSU52	269	351520

6.18 **POWER SUPPLY BOARD**
DP351130 (14-LMU-3A)
Refer to Fig. No.19

Item	Circuit Function	Description	Manufacturer Code	Manufacturer Designation	Supplier Code	STC DP Number
	Capacitors					
C1	Filtering	22uF 16V Tant		43212 Tag	158	260447
C2	Suppressor	.01uF Ceramic	276	K800011/801	231	342937
C3	Coupling	22uf 16V Tant		43212 Tag	158	260447
	Diodes					
D1	Reference	5.1V Zener		BZY8865V1	233	351502
D2	Base Bias	Silicon	178	IN4148	178	346307
D3	Base Bias	Silicon	178	IN4148	178	346307
D4	D.C. Blocking	Silicon	178	IN4148	178	346307
D5	D.C. Blocking	Silicon	178	IN4148	178	346307
D6	D.C. Blocking	Silicon	178	IN4148	178	346307
	Resistors					
R1	D1 Start Up	18K 5% Carbon Film		CR25	233	342909
R2	TR1 Current Limit	2.2 ohm 2% Metal Oxide		MR25	233	351257
R3	D1 Current Limit	1K 2% Metal Oxide		MR25	233	342893
R4	Emitter Resistor	680 ohm 5% Carbon Film		CR25	233	342923
R5	TR3 Base Bias	5.1K 2% Metal Oxide		MR25	233	351264
R6	TR4 Base Bias	1K 5% Carbon Film		CR25	233	342921

Item	Circuit Function	Description	Manufacturer Code	Manufacturer Designation	Supplier Code	STC DP Number
	Diodes					
D3	TX Switch	Silicon		BA244	233	351501
D4	Not Used					
D5	Switch	Silicon		BA244	233	351501
	Ferrite Beads					
FB1	Suppressor	Ferrite Tube		FX1483	78	342883
FB2	Filtering	Ferrite Bead		FX1242	78	203742
FB3	Filtering	Ferrite Bead		FX1242	78	203742
	Inductors					
L1	Not Used					
L2	Base Choke	1uH		58-10-0005-10	131	351201
L3	Supply Decoupling	1uH		58-10-0076-10	131	351200
L4	Filter	Coil	1		1	351233
L5	Filter	Coil	1		1	351233
L6	Filter	Coil	1		1	351233
L7	Supply Decoupling	1uH		58-10-0076-10	131	351200
L8	Static Discharge	1uH		58-10-0005-10	131	351201
	Resistors					
R1	Base Bias	1K 5% Carbon Film		CR25	233	342921
R2	Isolating	47 ohm 5% Carbon Film		CR25	233	342932
R3	Suppressor	33 ohm 5% Carbon Film		CR25	233	342896
R4	Damper	100 ohm 5% Carbon Film		CR25	233	342930
R5 to R11	Not Used					
R12	Bias	100K 5% Carbon Film		CR25	233	342902
R13	Current Limit	270 ohm 5% Carbon Film		CR25	233	342927
R14	Bias	100K 5% Carbon Film		CR25	233	342902
	Transistors					
TR1	Input Amplifier	Silicon N.P.N.	186	MRF606	269	351515
TR2	Output Amplifier	Silicon N.P.N.	184	PT4544	273	351527

6.17 POWER AMPLIFIER 25W - HIGH BAND

DP351030 (28-LMU-14A)

Refer to Fig. No.18

Item	Circuit Function	Description	Manufacturer Code	Manufacturer Designation	Supplier Code	STC DP Number
	Capacitors					
C1	Input Coupling	.001uF Ceramic	276	K2600/831	231	342938
C2	L.F. Bypass	1uF 35V Tant.		43212 Tag	158	260962
C3	Not Used					
C4	Filtering	4.7uF 25V Tant.		43212 Tag	158	260440
C5	Input Matching	5-65pF Variable		2222-808-01001	233	351332
C6	H.F. Bypass	.001uF Ceramic	276	K2600/831	231	342938
C7	Tuning	22pF 5% Ceramic	276	N150/A	231	351314
C8	L.F. Bypass	1uF 35V Tant.		43212 Tag	158	260962
C9	Coupling	8.2pF ±.5pF Ceramic	276	N080/861	231	342949
C10	Tuning	5-65pF Variable		2222-808-01001	233	351332

Item	Circuit Function	Description	Manufacturer Code	Manufacturer Designation	Supplier Code	STC DP Number
	Diodes					
D5	TX Switch	Silicon		BA244	233	351501
D6	Bias	Silicon		IN4148	178	346307
D7	Bias	Silicon		IN4148	178	346307
	Ferrite Beads					
FB1	Base Choke	Ferrite Bead		FX1242	78	203742
FB2	Suppressor	Ferrite Bead		FX1242	78	203742
FB3	Base Choke	Ferrite Bead		FX1242	78	203742
FB4	Suppressor	Ferrite Tube		FX1483	78	342883
FB5	Suppressor	Ferrite Bead		FX1242	78	203742
FB6	Suppressor	Ferrite Tube		FX1483	78	342883
FB7	Filtering	Ferrite Tube		FX1242	78	203742
FB8	Filtering	Ferrite Tube		FX1242	78	203742
	Inductors					
L1	Base Choke	1uH		58-10-0005-10	131	351201
L2	Supply Decoupling	4.7uH		58-10-0009-10	131	351619
L3	Collector Tuning	Coil	1		1	351248
L4	Collector Tuning	Coil	1		1	351249
L5	Supply Decoupling	Ferrite Choke		58-10-0015-10	131	342877
L6	Supply Decoupling	4.7uH		58-10-0080-10	131	351610
L7	Filter	Coil	1		1	351607
L8	Filter	Coil	1		1	351608
L9	Filter	Coil	1		1	351609
L10	Static Discharge	4.7uH		58-10-0009-10	131	351619
L11	Supply Decoupling	4.7uH		58-10-0009-10	131	351619
L12	Supply Decoupling	4.7uH		58-10-0009-10	131	351619
L13	Supply Decoupling	4.7uH		58-10-0009-10	131	351619
L14	Filtering	1mH		58-10-0023-10	131	351622
L15	Input Matching	1uH		58-10-0005-10	131	351201
	Resistors					
R1	Input Matching	22 ohm 5% Carbon Film		CR25	233	342933
R2	Damper	47 ohm 10% Metal Oxide	275	RS1	275	351274
R3	Supply Decoupling	47 ohm 5/ Carbon Film		CR25	233	342932
R4	Damper	330 ohm 5% Carbon Film		CR25	233	342926
R5	Damper	100 ohm 5% Carbon Film		CR25	233	342930
R6	Damper	100 ohm 10% Metal Oxide	275	RS1	275	351275
R7	Damper	10 ohm 5% Carbon Film		CR25	233	342934
R8	Not Used					
R9	Current Limit	100 ohm 5% Carbon Film		CR25	233	342930
R10	Base Bias	680 ohm 5% Carbon Film		CR25	233	342923
R11	Base Bias	1K 5% Carbon Film		CR25	233	342921
R12	Base Bias	Adjust on Test		CR25		
R13	Current Limit	1.5K 5% Carbon Film		CR25	233	342919
R14	Current Limit	1.5K 5% Carbon Film		CR25	233	342919
R15	Current Limit	100 ohm 5% Carbon Film		CR25	233	342930
R16	Current Limit	1.5K 5% Carbon Film		CR25	233	342919

Item	Circuit Function	Description	Manufacturer Code	Manufacturer Designation	Supplier Code	STC DP Number
	Ferrite Beads					
FB1 to FB3	Not Used					
FB4	Suppressor	Ferrite Tube		FX1483	78	342883
FB5	Suppressor	Ferrite Bead		FX1242	78	203742
FB6	Suppressor	Ferrite Tube		FX1483	78	342883
FB7	Filtering	Ferrite Bead		FX1242	78	203742
FB8	Filtering	Ferrite Bead		FX1242	78	203742
	Inductors					
L1	Input Matching	Coil	1		1	351219
L2	Base Choke	4.7uH		58-10-0009-10	131	351619
L3	Supply Decoupling	Ferrite Choke	1		1	351623
L4	Supply Decoupling	Coil	1		1	351638
L5	Base Choke	4.7uH		58-10-0009-10	131	351619
L6	Supply Decoupling	4.7uH		58-10-0080-10	131	351610
L7	Filter	Coil	1		1	351607
L8	Filter	Coil	1		1	351608
L9	Filter	Coil	1		1	351609
L10	Static Discharge	4.7uH		58-10-0080-10	131	351610
L11	Supply Decoupling	4.7uH		58-10-0080-10	131	351610
L12	Supply Decoupling	4.7uH		58-10-0080-10	131	351610
L13	Supply Decoupling	4.7uH		58-10-0080-10	131	351610
L14	Filtering	1mH		58-10-0023-10	131	351622
	Resistors					
R1	Damper	100 ohm 5% Carbon Film		CR25	233	342930
R2	Base Bias	100 ohm 5% Carbon Film		CR25	233	342930
R3	Base Bias	68 ohm 5% Carbon Film		CR25	233	342931
R4	Base Bias	1K 5% Carbon Film		CR25	233	342921
R5	Damper	220 ohm 5% Carbon Film		CR25	233	342928
R6	Not Used					
R7	Damper	22 ohm 5% Carbon Film		CR25	233	342933
R8	Not Used					
R9	Current Limit	100 ohm 5% Carbon Film		CR25	233	342930
R10 to R12	Not Used					
R13	Current Limit	1.5K 5% Carbon Film		CR25	233	342919
R14	Current Limit	1.5K 5% Carbon Film		CR25	233	342919
R15	Current Limit	100 ohm 5% Carbon Film		CR25	233	342930
R16	Current Limit	1.5K 5% Carbon Film		CR25	233	342919
	Transistors					
TR1	Amplifier	N.P.N. Silicon	186	2N4427	269	351528
TR2	Amplifier	N.P.N. Silicon	184	PT4544	273	351631

Item	Circuit Function	Description	Manufacturer Code	Manufacturer Designation	Supplier Code	STC DP Number
	Resistors					
R8	Base Bias	10K 5% Carbon Film		CR25	233	342911
R9	Base Bias	6.8K 5% Carbon Film		CR25	233	342913
R10	Emitter Resistor	470 ohm 5% Carbon Film		CR25	233	342924
R11	Supply Decoupling	100 ohm 5% Carbon Film		CR25	233	342930
R12	Base Bias	10K 5% Carbon Film		CR25	233	342911
R13	Supply Decoupling	100 ohm 5% Carbon Film		CR25	233	342930
R14	Emitter Resistor	15 ohm 5% Carbon Film		CR25	233	351251
R15	Base Bias	3.3K 5% Carbon Film		CR25	233	342917
R16	Base Bias	2.2K 5% Carbon Film		CR25	233	342918
R17	Emitter Resistor	82 ohm 10% Carbon Film		CR25	233	351253
R18	Supply Decoupling	82 ohm 10% Carbon Film		CR25	233	351253
R19	Emitter Resistor	15 ohm 5% Carbon Film		CR25	233	351251
R20	Damper	1K 5% Carbon Film		CR25	233	342921
R21	Terminating	47 ohm 5% Carbon Film		CR25	233	342932
R22	Damper	100 ohm 5% Carbon Film		CR25	233	342930
R23	Damper	1K 5% Carbon Film		CR25	233	342921
R24	Supply Decoupling	33 ohm 5% Carbon Film		CR25	233	342896
R25	Base Bias	3.3K 5% Carbon Film		CR25	233	342917
R26	Base Bias	6.8K 5% Carbon Film		CR25	233	342913
R27	Collector Load	120 ohm 5% Carbon Film		CR25	233	351254
R28	Emitter Resistor	100 ohm 5% Carbon Film		CR25	233	342930
R29	Supply Decoupling	100 ohm 5% Carbon Film		CR25	233	342930
R30	D3 Bias	33K 2% Metal Oxide		MR25	233	351270
R31	Matching	100 ohm 5% Carbon Film		CR25	233	342930
R32	Base Bias	3.3K 5% Carbon Film		CR25	233	342917
	Transformers					
T1	Not Used					
T2	Tuning	Can Assy	1		1	351216
T3	Tuning	Can Assy	1		1	351217
T4	Not Used					
T5	Tuning	Can Assy	1		1	351223
T6	Filter	Can Assy	1		1	351224
T7	Filter	Can Assy	1		1	351225
	Transistors					
TR1	Modulator	N.P.N. Silicon	158	2N918	158	260215
TR2	Amplifier	N.P.N. Silicon	158	2N918	158	260215
TR3	Tripler	N.P.N. Silicon		BSX19	78	342996
TR4	Amplifier	N.P.N. Silicon		BSX19	78	342996
TR5	Doubler	N.P.N. Silicon		2N4427	78	342995
TR6	Modulator	N.P.N. Silicon	158	2N918	158	260215

Item	Circuit Function	Description	Manufacturer Code	Manufacturer Designation	Supplier Code	STC DP Number
	Resistors					
R32	Emitter Resistor	15 ohm 5% Carbon Film		CR25	233	351251
R33	Damper	470 ohm 5% Carbon Film		CR25	233	342924
R34	Base Bias	4.7K 5% Carbon Film		CR25	233	342916
R35	Base Bias	2.2K 5% Carbon Film		CR25	233	342918
R36	Supply Decoupling	100 ohm 5% Carbon Film		CR25	233	342930
R37	Emitter Resistor	47 ohm 5% Carbon Film		CR25	233	342932
	Transformers					
T1	Tuning	Can Assy	1		1	351245
T2	Tuning	Can Assy	1		1	351246
T3	Filter	Can Assy	1		1	351247
	Transistors					
TR1	Modulator	Silicon N.P.N.	158	2N918	158	260215
TR2	Modulator	Silicon N.P.N.	158	2N918	158	260215
TR3	Modulator	Silicon N.P.N.	158	2N918	158	260215
TR4	Amplifier	Silicon N.P.N.	158	2N918	158	260215
TR5	Amplifier	Silicon N.P.N.	158	2N918	158	260215
TR6	Tripler	Silicon N.P.N.		BSX19	78	342996
TR7	Amplifier	Silicon N.P.N.		2N4427	78	342995

6.13 TRANSMITTER MULTIPLIER BOARD - HIGH BAND

DP351040 (270-LMU-1A)

Refer to Fig. No.14

Item	Circuit Function	Description	Manufacturer Code	Manufacturer Designation	Supplier Code	STC DP Number
	Capacitors					
C1	Coupling	.001uF Ceramic	276	K2600/831	231	342938
C2	Coupling	10uF 25V Tant		43212 Tag	158	351328
C3	D.C. Blocking	.01uF Ceramic	276	K800011/801	231	342937
C4	Bypass	.01uF Ceramic	276	K800011/801	231	342937
C5	Coupling	.001uF Ceramic	276	K2600/831	231	342938
C6	Coupling	10uF 25V Tant		43212 Tag	158	351328
C7	Bypass	.01uF Ceramic	276	K800011/801	231	342937
C8	Tuning	220pF 2.5% Styroseal			272	351321
C9	Supply Decoupling	.01uF Ceramic	276	K800011/801	231	342937
C10	Tuning	330pF 2.5% Styroseal			272	351322
C11	Coupling	.001uF Ceramic	276	K2600/831	231	342938
C12	Decoupling	.01uF Ceramic	276	K800011/801	231	342937
C13	Decoupling	.001uF Ceramic	276	K2600/831	231	342938
C14	Coupling	18pF 5% Ceramic	276	NPO/YD	231	351311
C15	Bypass	.001uF Ceramic	276	K2600/831	231	342938
C16	Tuning	10pF 10% Ceramic	276	NPO/YD	231	351308
C17	Tuning	2-20pF Variable		2222-809-05003	233	351333
C18	Coupling	.001uF Ceramic	276	K2600/831	231	342938
C19	Filtering	.001uF Ceramic	276	K2600/831	231	342938
C20	Bypass	.001uF Ceramic	276	K2600/831	231	342938
C21	Tuning	12pF 5% Ceramic	276	NPO/YD	231	351309
C22	Tuning	2-20pF Variable		2222-809-05003	233	351333

Item	Circuit Function	Description	Manufacturer Code	Manufacturer Designation	Supplier Code	STC DP Number
	Transistors					
TR1	Amplifier	N.P.N. Silicon	158	BC109	158	351519
TR2	D.C. Control	P.N.P. Silicon		BC212K	159	342981
TR3	Amplifier	N.P.N. Silicon	158	BC109	158	351519
TR4	Buffer	N.P.N. Silicon	158	BC109	158	351519
TR5	Buffer	N.P.N. Silicon	158	BC109	158	351519

6.12 TRANSMITTER MULTIPLIER BOARD - LOW BAND
DP351602 (270-LMU-1B)
Refer to Fig. No.13

Item	Circuit Function	Description	Manufacturer Code	Manufacturer Designation	Supplier Code	STC DP Number
	Capacitors					
C1	Input Coupling	.001uF Ceramic	276	K2600/831	231	342938
C2	Bypass	.01uF Ceramic	276	K800011/801	231	342937
C3	Phase Shift	22pf 5% Ceramic	276	NPO/YD	231	351313
C4	Coupling	10uf 25V Tant.		43212 Tag	158	351328
C5	Coupling	.001uf Ceramic	276	K2600/831	231	342938
C6	Bypass	.01uF Ceramic	276	K800011/801	231	342937
C7	D.C. Block	.01uF Ceramic	276	K800011/801	231	342937
C8	Coupling	10uf 25V Tant.		43212 Tag	158	351328
C9	Coupling	.001uF Ceramic	276	K2600/831	231	342938
C10	Bypass	.01uF Ceramic	276	K800011/801	231	342937
C11	Phase Shift	47pf 5% Ceramic	276	NPO/YD	231	351337
C12	Coupling	10uf 25V Tant.		43212 Tag	158	351328
C13	Coupling	.001uF Ceramic	276	K2600/831	231	342938
C14	Not Used					
C15	Bypass	.01uF Ceramic	276	K800011/801	231	342937
C16	Bypass	.01uF Ceramic	276	K800011/801	231	342937
C17	Tuning	2-20pF Variable		2222-809-05003	233	351333
C18	Not Used					
C19	Coupling	.001uF Ceramic	276	K2600/831	231	342938
C20	Supply Decoupling	.01uF Ceramic	276	K800011/801	231	342937
C21	Bypass	.01uF Ceramic	276	K800011/801	231	342937
C22	Bypass	.01uF Ceramic	276	K800011/801	231	342937
C23	Coupling	10pF 10% Ceramic	276	NPO/YD	233	351308
C24	Not Used					
C25	Supply Decoupling	.01uF Ceramic	276	K800011/801	231	342937
C26	Tuning	2-20pf Variable		2222-809-05003	233	351333
C27	Coupling	10pF 10% Ceramic	276	NPO/YD	231	351308
C28	Matching	33pF 5% Ceramic	276	N750/YD	231	351336
C29	Bypass	.001uF Ceramic	276	K2600/831	231	342938
C30	Tuning	2-20pf Variable		2222-809-05003	233	351333
C31	Tuning	10pF 10% Ceramic	276	NPO/YD	231	351308
C32	Bypass	.01uF Ceramic	276	K800011/801	231	342937
C33	Coupling	2pf 0.1% Ceramic	276	AP	231	351301
C34	Tuning	2-20pf Variable		2222-809-05003	233	351333
C35	Tuning	2-20pf Variable		2222-809-05003	233	351333
C36	Coupling	2pf 0.1% Ceramic	276	AP	231	351301
C37	Tuning	2-20pf Variable		2222-809-05003	233	351333
C38	Tuning	6.8pf 10% Ceramic	276	P100/YD	231	351307

Item	Circuit Function	Description	Manufacturer Code	Manufacturer Designation	Supplier Code	STC DP Number
	Resistors					
R306 to R400	Not Used					
	Note R401 to R405 applicable to 12 channel only					
R401	Base Bias	4.7K 5% Carbon Film		CR25	233	342916
R402	Base Bias	4.7K 5% Carbon Film		CR25	233	342916
R403	Damper	1K 5% Carbon Film		CR25	233	342921
R404	Supply Decoupling	47 ohm 5% Carbon Film		CR25	233	342932
R405	Output Matching	1.5K 5% Carbon Film		CR25	233	342919
	Transformers					
	8 and 12 Channel Transmitter Oscillator					
T1	TX Output	Ferrite Assy	1		1	342114
T2 to T200	Not Used					
T201	Oscillator Output	Can Assy	1		1	342118
T202 to T300	Not Used					
T301	Oscillator Output	Can Assy	1		1	342118
T302 to T400	Not Used					
	Note T401 applicable to 12 channel only					
T401	Oscillator Output	Can Assy	1		1	342118
	8 and 12 Channel Receiver Oscillator					
T1	RX Output	Ferrite Assy	1		1	342114
T2 to T200	Not Used					
T201	Oscillator Output	Can Assy	1		1	342119
T202 to T300	Not Used					
T301	Oscillator Output	Can Assy	1		1	342119
T302 to T400	Not Used					
	Note T401 applicable to 12 channel only					
T401	Oscillator Output	Can Assy	1		1	342119
	Transistors					
TR1	Amplifier	Silicon N.P.N.	158	2N918	158	260215
TR2	Oscillator	Silicon N.P.N.	158	2N918	158	260215
TR3	Oscillator	Silicon N.P.N.	158	2N918	158	260215
TR4	Oscillator	Silicon N.P.N.	158	2N918	158	260215

6.11 TRANSMITTER MICROPHONE AMPLIFIER

DP351050 (28-LMU-4A)

Item	Circuit Function	Description	Manufacturer Code	Manufacturer Designation	Supplier Code	STC DP Number
	Capacitors					
C1	Input Coupling	1uF 35V Tant.		43212 Tag	158	351327
C2	Bypass	33uf 25V Tant.		43212 Tag	158	260449
C3	Supply Decoupling	33uf 25V Tant.		43212 Tag	158	260449
C4	Coupling	.0047uF 2.5% 63V Poly.	182	HS	182	351324
C5	Filtering	.001uF Ceramic	276	K2600/831	231	342938
C6	Filtering	.01uf Ceramic	276	K800011/801	231	342937
C7	Supply Decoupling	33uF 25V Tant.		43212 Tag	158	260449
C8	Bypass	100uf 25V Tant.		43212 Tag	158	351331

Item	Circuit Function	Description	Manufacturer Code	Manufacturer Designation	Supplier Code	STC DP Number
	Inductors					
L32 to L40	Not Used					
L41	Crystal Compensation	Can Assy	1		1	342116
L42 to L50	Not Used					
L51	Crystal Compensation	Can Assy	1		1	342116
L52 to L60	Not Used					
L61	Crystal Compensation	Can Assy	1		1	342116
L62 to L70	Not Used					
L71	Crystal Compensation	Can Assy	1		1	342116
L72 to L80	Not Used					
L81	Crystal Compensation	Can Assy	1		1	342116
L82 to L90	Not Used					
	Note L91 to L121 applicable to 12 channel only					
L91	Crystal Compensation	Can Assy	1		1	342116
L92 to L100	Not Used					
L101	Crystal Compensation	Can Assy	1		1	342116
L102 to L110	Not Used					
L111	Crystal Compensation	Can Assy	1		1	342116
L112 to L120	Not Used					
L121	Crystal Compensation	Can Assy	1		1	342116
	Resistors					
	8 Channel Receiver Oscillator Board					
R1	Base Bias	4.7K 5% Carbon Film		CR25	233	342916
R2	Base Bias	1K 5% Carbon Film		CR25	233	342921
R3	Emitter Resistor	150 ohm 5% Carbon Film		CR25	233	342929
	8 Channel Transmitter Oscillator Board					
R1	Base Bias	3.3K 5% Carbon Film		CR25	233	342917
R2	Base Bias	1K 5% Carbon Film		CR25	233	342921
R3	Emitter Resistor	270 ohm 5% Carbon Film		CR25	233	342927
	12 Channel Receiver Oscillator Board					
R1	Base Bias	10K 5% Carbon Film		CR25	233	342911
R2	Base Bias	2.2K 5% Carbon Film		CR25	233	342918
R3	Emitter Resistor	150 ohm 5% Carbon Film		CR25	233	342929
	12 Channel Transmitter Oscillator Board					
R1	Base Bias	6.8K 5% Carbon Film		CR25	233	342913
R2	Base Bias	2.2K 5% Carbon Film		CR25	233	342918
R3	Emitter Resistor	270 ohm 5% Carbon Film		CR25	233	342927
R4 to R10	Not Used					
R11	Diode Bias	100K 5% Carbon Film		CR25	233	342902
R12	Isolating	330 ohm 5% Carbon Film		CR25	233	342926
R13	Damper	1K 5% Carbon Film		CR25	233	342921
R14 to R20	Not Used					
R21	Diode Bias	100K 5% Carbon Film		CR25	233	342902
R22	Isolating	330 ohm 5% Carbon Film		CR25	233	342926
R23	Damper	1K 5% Carbon Film		CR25	233	342921
R24 to R30	Not Used					
R31	Diode Bias	100K 5% Carbon Film		CR25	233	342902

Item	Circuit Function	Description	Manufacturer Code	Manufacturer Designation	Supplier Code	STC DP Number
	Capacitors					
C101	Crystal Compensation	2-22pf Variable		2222-808-00006	233	342852
C102	Bypass	.01uF Ceramic	276	K800011/801	231	342937
C103 to C110	Not Used					
C111	Crystal Compensation	2-22pf Variable		2222-808-00006	233	342852
C112	Bypass	.01uf Ceramic	276	K800011/801	231	342937
C113 to C120	Not Used					
C121	Crystal Compensation	2-22pf Variable		2222-808-00006	233	342852
C122	Bypass	.01uf Ceramic	276	K800011/801	231	342937
C123 to C200	Not Used					
C201	Bypass	.01uf Ceramic	276	K800011/801	231	342937
C202	Bypass	.01uf Ceramic	276	K800011/801	231	342937
C203	Oscillator Tuning	2-22pf Variable		2222-808-00006	233	342952
C204 to C300	Not Used					
C301	Bypass	.01uf Ceramic	276	K800011/801	231	342937
C302	Bypass	.01uf Ceramic	276	K800011/801	231	342937
C303	Oscillator Tuning	2-22pf Variable		2222-808-00006	233	342952
C304 to C400	Not Used					
	Note C401 to C403 applicable to 12 channel only.					
C401	Bypass	.01uf Ceramic	276	K800011/801	231	342937
C402	Bypass	.01uf Ceramic	276	K800011/801	231	342937
C403	Oscillator Tuning	2-22pf Variable		2222-808-00006	233	342952
	Diodes					
D1 to D10	Not Used					
D11	Isolating	Silicon	178	1N4148	178	346307
D12 to D20	Not Used					
D21	Isolating	Silicon	178	1N4148	178	346307
D22 to D30	Not Used					
D31	Isolating	Silicon	178	1N4148	178	346307
D32 to D40	Not Used					
D41	Isolating	Silicon	178	1N4148	178	346307
D42 to D50	Not Used					
D51	Isolating	Silicon	178	1N4148	178	346307
D52 to D60	Not Used					
D61	Isolating	Silicon	178	1N4148	178	346307
D62 to D70	Not Used					
D71	Isolating	Silicon	178	1N4148	178	346307
D72 to D80	Not Used					
D81	Isolating	Silicon	178	1N4148	178	346307
D82 to D90	Not Used					
	Note D91 to D121 applicable to 12 channel only.					
D91	Isolating	Silicon	178	1N4148	178	346307
D92 to D100	Not Used					
D101	Isolating	Silicon	178	1N4148	178	346307
D102 to D110	Not Used					
D111	Isolating	Silicon	178	1N4148	178	346307
D112 to D120	Not Used					
D121	Isolating	Silicon	178	1N4148	178	346307
D122 to D200	Not Used					
D201	Isolating	Silicon	178	1N4148	178	346307
D202 to D300	Not Used					

Item	Circuit Function	Description	Manufacturer Code	Manufacturer Designation	Supplier Code	SIC DP Number
	Resistors					
R12	Isolating	330 ohm 5% Carbon Film		CR25	233	342926
R13	Damper	1K 5% Carbon Film		CR25	233	342921
R14 to R20	Not Used					
R21	Diode Bias	100K 5% Carbon Film		CR25	233	342902
R22	Isolating	330 ohm 5% Carbon Film		CR25	233	342926
R23	Damper	1K 5% Carbon Film		CR25	233	342921
R24 to R30	Not Used					
R31	Diode Bias	100K 5% Carbon Film		CR25	233	342902
R32	Isolating	330 ohm 5% Carbon Film		CR25	233	342926
R33	Damper	1K 5% Carbon Film		CR25	233	342921
R34 to R40	Not Used					
R41	Diode Bias	100K 5% Carbon Film		CR25	233	342902
R42	Isolating	330 ohm 5% Carbon Film		CR25	233	342926
R43	Damper	1K 5% Carbon Film		CR25	233	342921
R44 to R50	Not Used					
R51	Diode Bias	100K 5% Carbon Film		CR25	233	342902
R52	Isolating	330 ohm 5% Carbon Film		CR25	233	342926
R53	Damper	1K 5% Carbon Film		CR25	233	342921
R54 to R60	Not Used					
R61	Diode Bias	100K 5% Carbon Film		CR25	233	342902
R62	Isolating	330 ohm 5% Carbon Film		CR25	233	342926
R63	Damper	1K 5% Carbon Film		CR25	233	342921
R64 to R70	Not Used					
R71	Diode Bias	100K 5% Carbon Film		CR25	233	342902
R72	Isolating	330 ohm 5% Carbon Film		CR25	233	342926
R73	Damper	1K 5% Carbon Film		CR25	233	342921
R74 to R80	Not Used					
R81	Diode Bias	100K 5% Carbon Film		CR25	233	342902
R82	Isolating	330 ohm 5% Carbon Film		CR25	233	342926
R83	Damper	1K 5% Carbon Film		CR25	233	342921
R84 to R200	Not Used					
R201	Base Bias	4.7K 5% Carbon Film		CR25	233	342916
R202	Base Bias	4.7K 5% Carbon Film		CR25	233	342916
R203	Damper	1K 5% Carbon Film		CR25	233	342921
R204	Supply Decoupling	47 ohm 5% Carbon Film		CR25	233	342932
R205	Output Matching	1.5K 5% Carbon Film		CR25	233	342919
R206 to R300	Not Used					
R301	Base Bias	4.7K 5% Carbon Film		CR25	233	342916
R302	Base Bias	4.7K 5% Carbon Film		CR25	233	342916
R303	Damper	1K 5% Carbon Film		CR25	233	342921
R304	Supply Decoupling	47 ohm 5% Carbon Film		CR25	233	342932
R305	Output Matching	1.5K 5% Carbon Film		CR25	233	342919
R306 to R400	Not Used					
R401	Base Bias	3.3K 5% Carbon Film		CR25	233	342917
R402	Base Bias	560 ohm 5% Carbon Film		CR25	233	342833
R403	Emitter Resistor	150 ohm 5% Carbon Film		CR25	233	342929
	Transformers					
T1	TX Output	Ferrite Assy	1		1	342114
T2 to T200	Not Used					
T201	Oscillator Output	Ferrite Assy	1		1	342118
T202 to T300	Not Used					

Item	Circuit Function	Description	Manufacturer Code	Manufacturer Designation	Supplier Code	STC DP Number
	Transistors					
TR1	Tx Oscillator	Silicon N.P.N.	158	2N918	158	260215
TR2	Tx Amplifier	Silicon N.P.N.	158	2N918	158	260215
TR3	Rx Oscillator	Silicon N.P.N.	158	2N918	158	260215
TR4	Rx Amplifier	Silicon N.P.N.	158	2N918	158	260215

6.9 TRANSMITTER/RECEIVER OSCILLATOR - FOUR CHANNEL
DP342187 (16-LMU-8A)
Refer to Fig. No.10

Item	Circuit Function	Description	Manufacturer Code	Manufacturer Designation	Supplier Code	STC DP Number
	Capacitors					
C1	Coupling	.01uF Ceramic	276	K800011/801	231	342937
C2	Bypass	.01uF Ceramic	276	K800011/801	231	342937
C3 to C10	Not Used					
C11	Crystal Compensation	2-22pF Variable		2222-808-00006	233	342852
C12	Bypass	.01uF Ceramic	276	K800011/801	231	342937
C13 to C20	Not Used					
C21	Crystal Compensation	2-22pF Variable		2222-808-00006	233	342852
C22	Bypass	.01uF Ceramic	276	K800011/801	231	342937
C23 to C30	Not Used					
C31	Crystal Compensation	2-22pF Variable		2222-808-00006	233	342852
C32	Bypass	.01uF Ceramic	276	K800011/801	231	342937
C33 to C40	Not Used					
C41	Crystal Compensation	2-22pF Variable		2222-808-00006	233	342852
C42	Bypass	.01uF Ceramic	276	K800011/801	231	342937
C43 to C50	Not Used					
C51	Crystal Compensation	2-22pF Variable		2222-808-00006	233	342852
C52	Bypass	.01uF Ceramic	276	K800011/801	231	342937
C53 to C60	Not Used					
C61	Crystal Compensation	2-22pF Variable		2222-808-00006	233	342852
C62	Bypass	.01uF Ceramic	276	K800011/801	231	342937
C63 to C70	Not Used					
C71	Crystal Compensation	2-22pF Variable		2222-808-00006	233	342852
C72	Bypass	.01uF Ceramic	276	K800011/801	231	342937
C73 to C80	Not Used					
C81	Crystal Compensation	2-22pF Variable		2222-808-00006	233	342852
C82	Bypass	.01uF Ceramic	276	K800011/801	231	342937
C83 to C200	Not Used					
C201	Bypass	.01uF Ceramic	276	K800011/801	231	342937
C202	Bypass	.01uF Ceramic	276	K800011/801	231	342937
C203	Tx Tuning	2-22pF Variable	276	2222-808-00006	233	342852
C204 to C300	Not Used					
C301	Bypass	.01uF Ceramic	276	K800011/801	231	342937
C302	Bypass	.01uF Ceramic	276	K800011/801	231	342937
C303	Rx Tuning	2-22pF Variable	276	2222-808-00006	233	342852
C304 to C400	Not Used					
C401	Coupling	.01uF Ceramic	276	K800011/801	231	342937
C402	Bypass	.01uF Ceramic	276	K800011/801	231	342937
C403 to C505	Not Used					

Item	Circuit Function	Description	Manufacturer Code	Manufacturer Designation	Supplier Code	STC DP Number
	Resistors					
R11	Emitter Resistor	680 ohm 5% Carbon Film		CR25	233	342923
R12	L.P. Filter	11K 2% Metal Glaze	17	RG¼	17	342756
R13	L.P. Filter	18K 2% Metal Glaze	17	RG¼	17	342754
R14	L.P. Filter	18K 2% Metal Glaze	17	RG¼	17	342754
R15	Filtering	10K 5% Carbon Film		CR25	233	342911
R16	Base Bias	1K 5% Carbon Film		CR25	233	342921
R17	Base Bias	1.2K 2% Metal Glaze	17	RG¼	17	342755
R18	A.C. Feedback	27K 5% Carbon Film		CR25	233	342907
R19	D.C. Feedback	4.7K 2% Metal Glaze	17	RG¼	17	342757
R20	Emitter Resistor	270 ohm 5% Carbon Film		CR25	233	342927
R21	Collector Load	2.2K 5% Carbon Film		CR25	233	342918
R22	Base Bias	1.8K 2% Metal Glaze	17	RG¼	17	342752
R23	Base Bias	1.1K 2% Metal Glaze	17	RG¼	17	342751
R24	Bootstrap	270 ohm 5% Carbon Film		CR25	233	342927
R25	Base Damper	1K 5% Carbon Film		CR25	233	342921
R26	Base Damper	1K 5% Carbon Film		CR25	233	342921
R27	Emitter Resistor	0.68 ohm 5% Wire Wound	17	BW½	17	263757
R28	Terminating	4.7K 5% Carbon Film		CR25	233	342916
R29	Base Bias	22K 5% Carbon Film		CR25	233	342908
R30	Base Bias	100K 5% Carbon Film		CR25	233	342902
R31	Supply Decoupling	270 ohm 5% Carbon Film		CR25	233	342927
R32	Temp Compensation	47 ohm Thermistor	14	A/T 262257	14	307190
R33	Emitter Resistor	39 ohm 5% Carbon Film		CR25	233	342750
R34	Emitter Resistor	1K 5% Carbon Film		CR25	233	342921
R35	Emitter Resistor	68 ohm 5% Carbon Film		CR25	233	342931
R36	Filtering	33K 5% Carbon Film		CR25	233	342906
R37	Base Bias	27K 5% Carbon Film		CR25	233	342907
R38	Base Bias	10K 5% Carbon Film		CR25	233	342911
R39	Collector Load	10K 5% Carbon Film		CR25	233	342911
R40	Emitter Resistor	270 ohm 5% Carbon Film		CR25	233	342927
R41	Divider	10K 5% Carbon Film		CR25	233	342911
R42	Divider	4.7K 5% Carbon Film		CR25	233	342916
R43	Divider	10K 5% Carbon Film		CR25	233	342911
R44	Supply Decoupling	270 ohm 5% Carbon Film		CR25	233	342927
R45	Divider	4.7K 5% Carbon Film		CR25	233	342916
R46	Not Used					
R47	D.C. Feedback	220K 5% Carbon Film		CR25	233	342900
	Transistors					
TR1	A.F. Amplifier	N.P.N. Silicon	158	TT194	158	349623
TR2	A.F. Amplifier	N.P.N. Silicon	158	TT194	158	349623
TR3	Buffer	N.P.N. Silcion	158	TT194	158	349623
TR4	A.F. Amplifier	N.P.N. Silicon	158	TT171	158	349622
TR5	Biasing	N.P.N. Silicon	158	TT171	158	349622
TR6	Driver	N.P.N. Silicon	158	TT171	158	349622
TR7	Driver	P.N.P. Silicon	158	TT212	158	349624
TR8	Power Output	N.P.N. Silicon	158	TT8140	158	349625
TR9	Power Output	N.P.N. Silicon	158	TT8140	158	349625
TR10	Noise Amplifier	N.P.N. Silicon	158	TT171	158	349622
TR11	D.C. Switch	N.P.N. Silicon	158	TT171	158	349622
TR12	D.C. Switch	N.P.N. Silicon	158	TT171	158	349622

Item	Circuit Function	Description	Manufacturer Code	Manufacturer Designation	Supplier Code	STC DP Number
	Capacitors					
C16	Not Used					
C17	Bypass	0.47uF 35V Tant.		43212 Tag	158	351326
	Ferrite Beads					
FB1	Suppressor	Ferrite Tube		FX1483	78	342883
FB2	Suppressor	Ferrite Tube		FX1483	78	342883
	Filter					
FL1	I.F. Filter	10.7MHz Crystal Filter	230	QMF 10M7	230	351505
	Inductor					
L1	Discriminator	Can Assy	1		1	351210
	Integrated Circuits					
IC1	I.F. Amplifier	Integrated Circuit	185	CA3053	7	342986
IC2	I.F. Limiter Discriminator	Integrated Circuit	278	ULN2111-A	269	351508
	Resistors					
R1	Filter Termination	1.2K 5% Carbon Film		CR25	233	342920
R2	Supply Decoupling	47 ohm 5% Carbon Film		CR25	233	342932
R3	Bias	1K 5% Carbon Film		CR25	233	342921
R4	Bias	2.2K 5% Carbon Film		CR25	233	342918
R5	Supply Decoupling	100 ohm 5% Carbon Film		CR25	233	342930
R6	Supply Decoupling	100 ohm 5% Carbon Film		CR25	233	342930
R7	Emitter Resistor	27K 5% Carbon Film		CR25	233	342907
R8	Emitter Resistor	1K 5% Carbon Film		CR25	233	342921
R9	Collector Resistor	4.7K 5% Carbon Film		CR25	233	342916
	Transformer					
T1	Matching	Can Assy	1		1	351211
	Transistor					
TR1	A.F. Amplifier	P.N.P. Silicon		BC214K	159	351522

6.7 RECEIVER A.F. & SQUELCH BOARD

DP351160

Refer to Fig. No.8

Item	Circuit Function	Description	Manufacturer Code	Manufacturer Designation	Supplier Code	STC DP Number
	Capacitors					
C1	Input Coupling	0.47uF 35V Tant.		43212 Tag	158	260434
C2	Supply Bypass	10uF 25V Tant.		43212 Tag	158	260444
C3	De-emphasis	.0018uF 10% Ceramic		2222-630-03182	233	342795
C4	Bypass	4.7uF 25V Tant.		43212 Tag	158	260440
C5	Coupling	0.1uF 35V Tant.		43212 Tag	158	270794
C6	Not Used					
C7	L.P. Filter	.0047uF 2.5% Poly.	182	TCS.HS Mini C	182	342797
C8	L.P. Filter	.022uF 2.5% Poly.	182	TSC.HS Mini C	182	342798

Item	Circuit Function	Description	Manufacturer Code	Manufacturer Designation	Supplier Code	STC DP Number
	Inductors					
L1	Tuning	Can Assy	1		1	351226
L2	Coupling	Coil	1		1	285246
L3	Tuning	Can Assy	1		1	351227
L4	Tuning	Can Assy	1		1	351228
L5	Coupling	Coil	1		1	285246
L6	Tuning	Can Assy	1		1	351229
L7	Coupling	Coil	1		1	285246
L8	Tuning	Can Assy	1		1	351230
	Resistors					
R1	Gate Bias	22K 5% Carbon Film		CR25	233	342908
R2	Gate Bias	22K 5% Carbon Film		CR25	233	342908
R3	Source Resistor	150 ohm 5% Carbon Film		CR25	233	342929
R4	Supply Decoupling	100 ohm 5% Carbon Film		CR25	233	342930
R5	Matching	5.6K 2% Metal Oxide		MR25	233	351265
R6	Gate Bias	22K 5% Metal Film		CR25	233	342908
R7	Gate Bias	22K 5% Metal Film		CR25	233	342908
R8	Supply Decoupling	100 ohm 5% Metal Film		CR25	233	342930
R9	Source Resistor	150 ohm 5% Metal Film		CR25	233	342929
	Transformers					
T1	Mixer Input Matching	Ferrite Assy	1		1	351209
T2	Filter Input Matching	10.7MHz Can Assy	212	10A-2	212	351204
T3	Filter Output Matching	10.7MHz Can Assy	212	10A-1	212	351222
T4	Output Matching	Ferrite Assy	1		1	351208
	Transistors					
TR1	R.F. Amplifier	FET		BFS28	78	351523
TR2	I.F. Amplifier	FET		BFS28	78	351523

6.5 RECEIVER MULTIPLIER BOARD – HIGH BAND

DP351170 (270-LMU-2A)

Refer to Fig. No.5

Item	Circuit Function	Description	Manufacturer Code	Manufacturer Designation	Supplier Code	STC DP Number
	Capacitors					
C1	Input Coupling	.01uF Ceramic	276	K800011/801	231	342937
C2	Bypass	.01uF Ceramic	276	K800011/801	231	342937
C3	Tuning	2-11pF Variable		2222-809-05002	233	351335
C4	Tuning	2-11pF Variable		2222-809-05002	233	351335
C5	Tuning	32pF 10% Ceramic	276	N080/801	231	342941
C6	Coupling	.001uF Ceramic	276	K2600/831	231	342938
C7	Tuning	2-20pF Variable		2222-809-05003	233	351333
C8	Bypass	.01uF Ceramic	276	K800011/801	231	342937
	Diodes					
D1	Bias	Silicon	178	IN4148	178	346307
D2	Bias	Silicon	178	IN4148	178	346307

Item	Circuit Function	Description	Manufacturer Code	Manufacturer Designation	Supplier Code	STC DP Number
	Resistors					
R6	Gate Bias	22K 5% Carbon Film		CR25	233	342908
R7	Gate Bias	22K 5% Carbon Film		CR25	233	342908
R8	Supply Decoupling	100 ohm, 5% Carbon Film		CR25	233	342930
R9	Source Resistor	150 ohm, 5% Carbon film		CR25	233	342929
	Transformers					
T1	Mixer Input Matching	Ferrite Assy	1		1	351234
T2	Filter Input Matching	10.7MHz Can Assy	212	10 A-2	212	351204
T3	Filter Output Matching	10.7MHz Can Assy	212	10 A-1	212	351222
T4	Output Matching	Ferrite Assy	1		1	351208
	Transistors					
TR1	R.F. Amplifier	FET		BFS28	78	351523
TR2	I.F. Amplifier	FET		BFS28	78	351523

6.3 **RECEIVER MULTIPLIER BOARD - LOW BAND**
DP351600 (270-LMU-28)
Refer to Fig. No.5

Item	Circuit Function	Description	Manufacturer Code	Manufacturer Designation	Supplier Code	STC DP Number
	Capacitors					
C1	Input Coupling	.01uF Ceramic	276	K800011/801	231	342937
C2	Bypass	.01uF Ceramic	276	K800011/801	231	342937
C3	Tuning	2-11pF Variable		2222-809-05002	233	351335
C4	Tuning	2-11pF Variable		2222-809-05002	233	351335
C5	Tuning	32pF, 10% Ceramic	276	N080/801	231	342941
C6	Coupling	.001uF Ceramic	276	K2600/831	231	342938
C7	Tuning	2-20pF Variable	276	2222-809-05003	231	351333
C8	Bypass	.01uF Ceramic	276	K800011/801	231	342937
	Diode					
D1	Bias	Silicon	178	IN4148	178	346307
	Ferrite Beads					
FB1	Suppressor	Ferrite Tube		FX1483	78	342883
FB2	Suppressor	Ferrite Tube		FX1483	78	342883
	Filter					
FL1	Supply Filter	Filtercon F/T	280	CFT3000	231	351507
	Inductors					
L1	Tuning	Can Assy	1		1	351241
L2	Tuning	Can Assy	1		1	351242
L3	Coupling	Coil	1		1	351401
	Resistors					
R1	Not Used					
R2	Base Bias	6.8K, 5% Carbon Film		CR25	233	342913

280. Erie Technological Products, Inc.,
644 West 12th Street,
Erie,
Pennsylvania. 16512. U.S.A.

281. C & K Components Inc.,
103 Morse Street,
Watertown,
Massachusetts. 02172. U.S.A.

158. STC Cannon Components Pty. Ltd.,
Moorebank Avenue,
Liverpool. N.S.W. 2170.

159. Texas Instruments Australia Ltd.,
Oldham Road,
Elizabeth. S.A. 5112.

178. Fairchild Aust. Pty. Ltd.,
46 Caroline Street,
South Yarra. Vic. 3141.

182. Allied Capacitors,
752 Pittwater Road,
Brookvale. N.S.W. 2100.

184. T.R.W. Semiconductors Inc.,
14520 Aviation Blvd.,
Lawndale. California, U.S.A. CA90260

185. Radio Corporation of America,
Harrison,
New Jersey. U.S.A.

186. Motorola Semiconductors,
Box 955,
Phoenix,
Arizona. U.S.A.

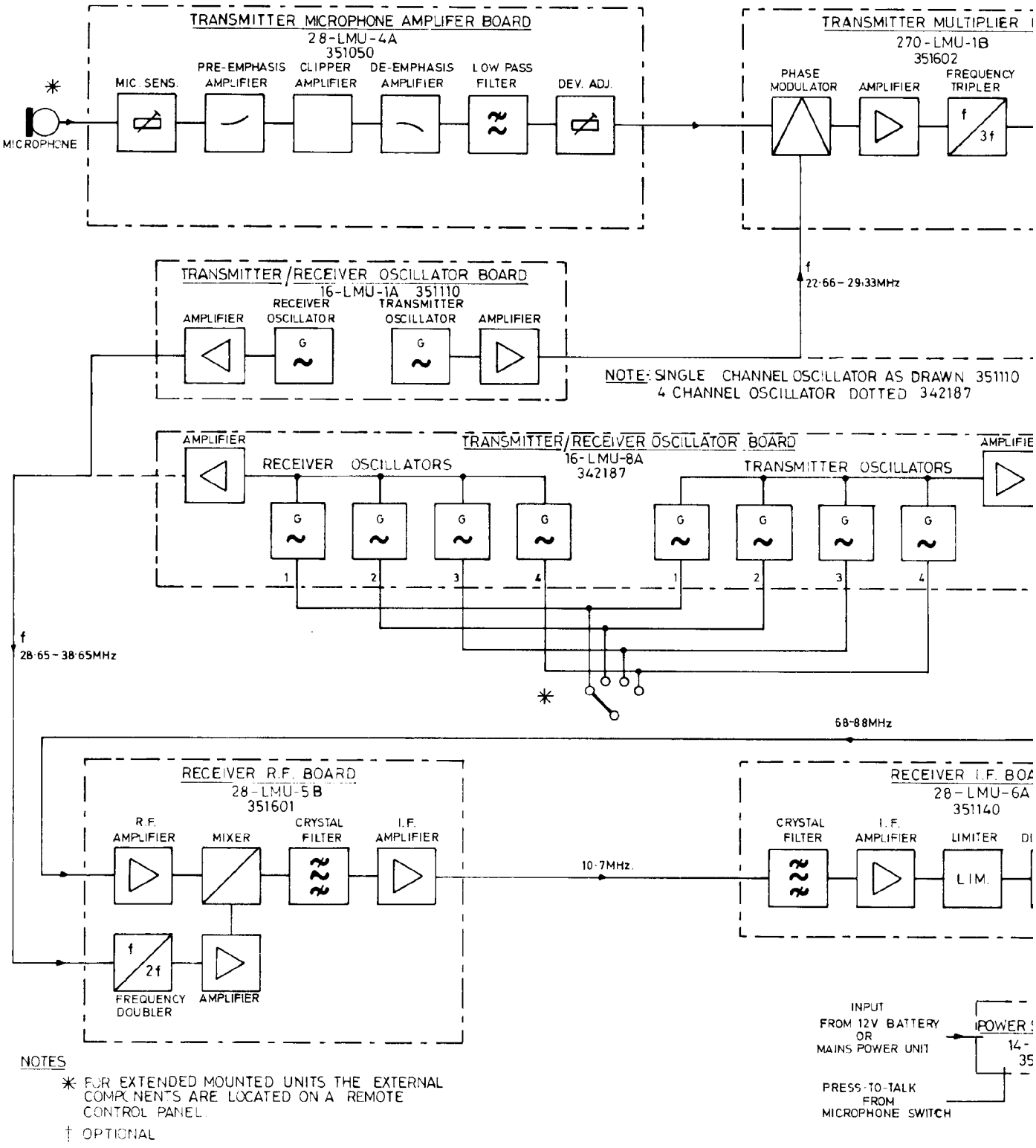
212. Toyo Communication Equipment Co. Ltd.,
484, 3-Chome Tsukakoshi,
Kawasaki. Japan.

230. Hy-Q Electronics Pty. Ltd.,
10-12 Rosella Street,
Frankstown. Vic. 3199.

231. Tri Components (Pty.) Ltd.,
75 Poath Road,
Hughsdale. Vic. 3166.

233. Elcoma Division,
Philips Industries Ltd.,
G.P.O. Box 2703,
Sydney. N.S.W. 2001.

269. Total Electronics (Sprague),
69 Archer Street,
Chatswood. N.S.W. 2067.



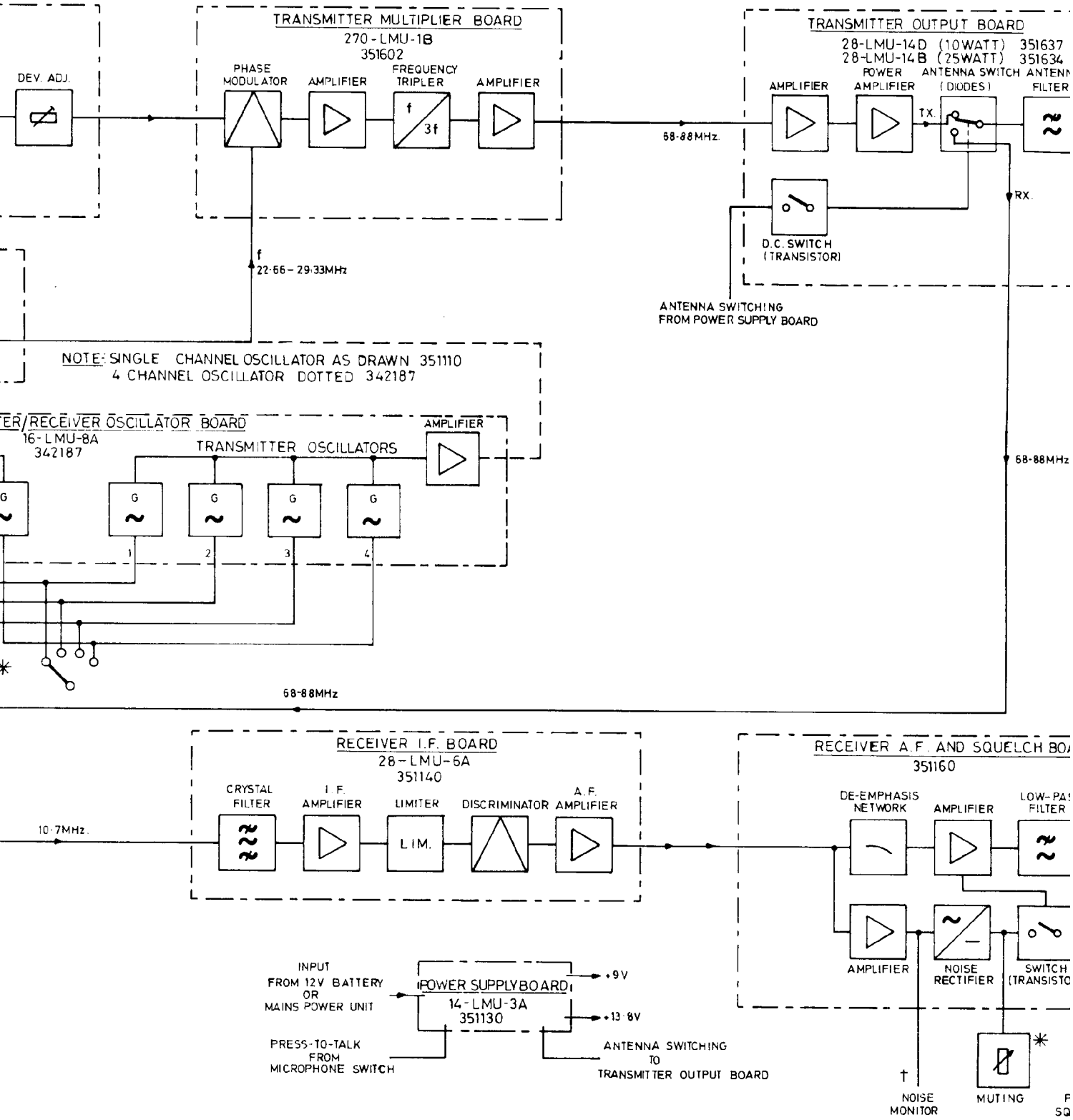


FIG 1

BLOCK DIAGRAM

SINGLE CHANNEL & 4 CHANNEL
LOW BAND (68-88MHz)

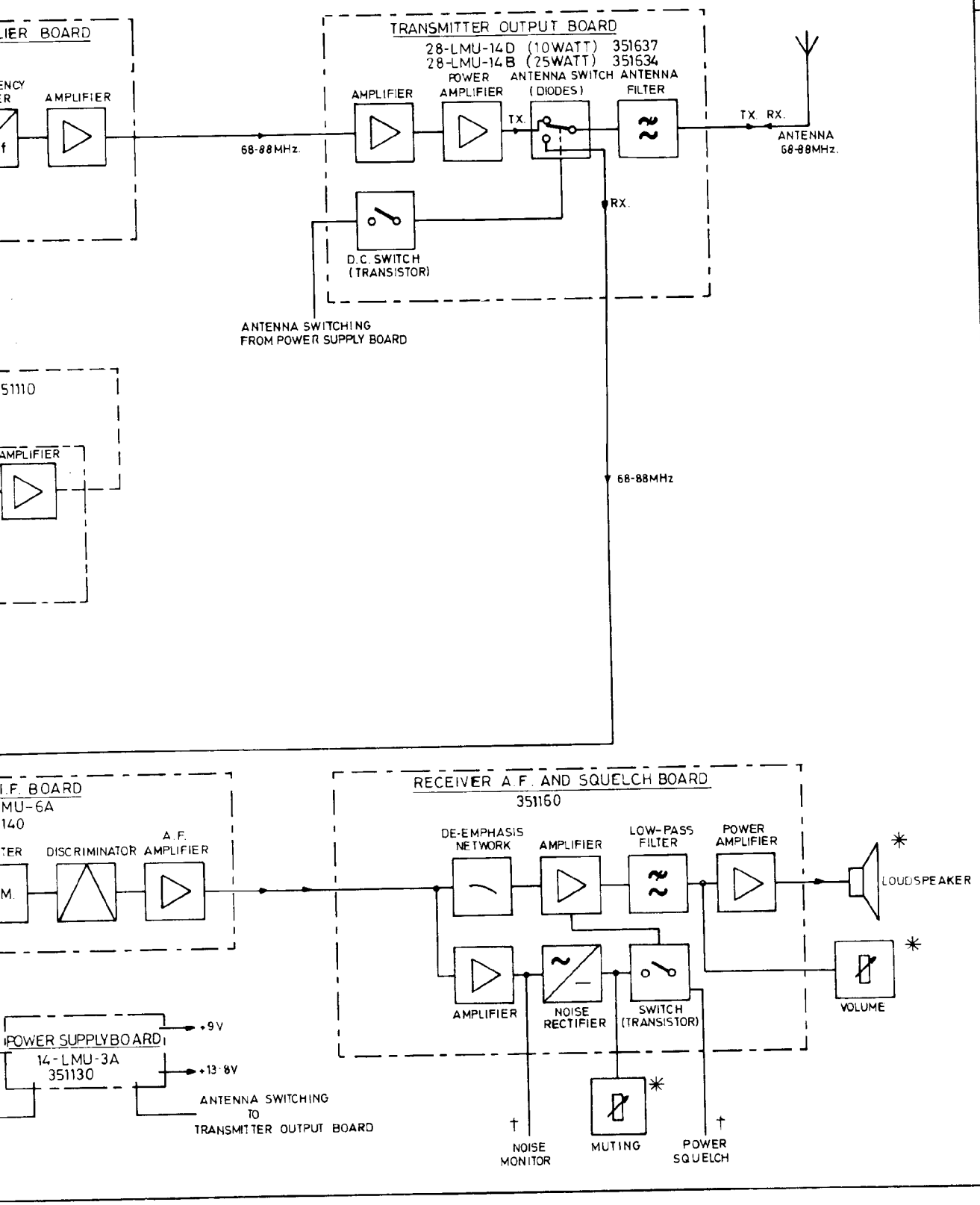
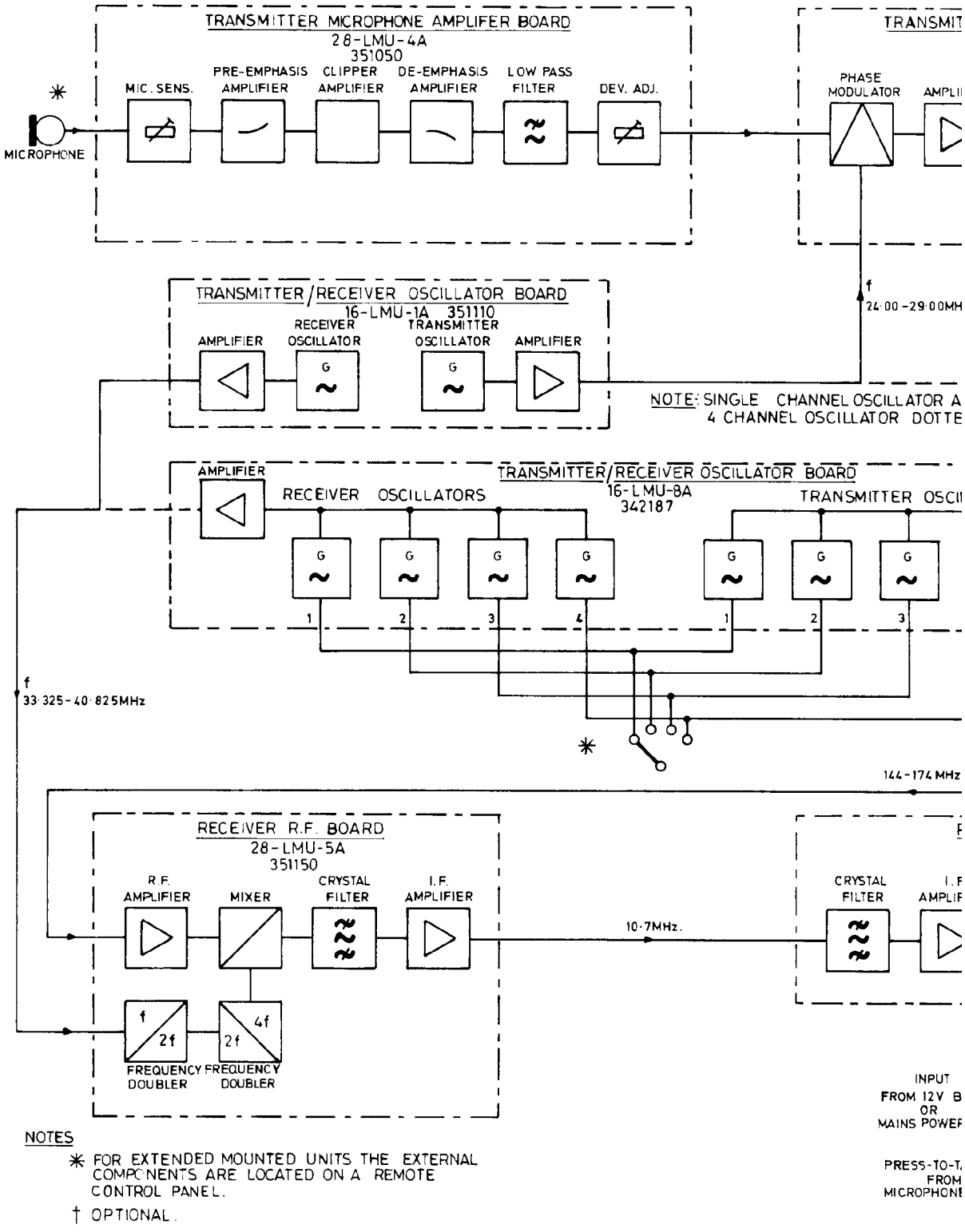


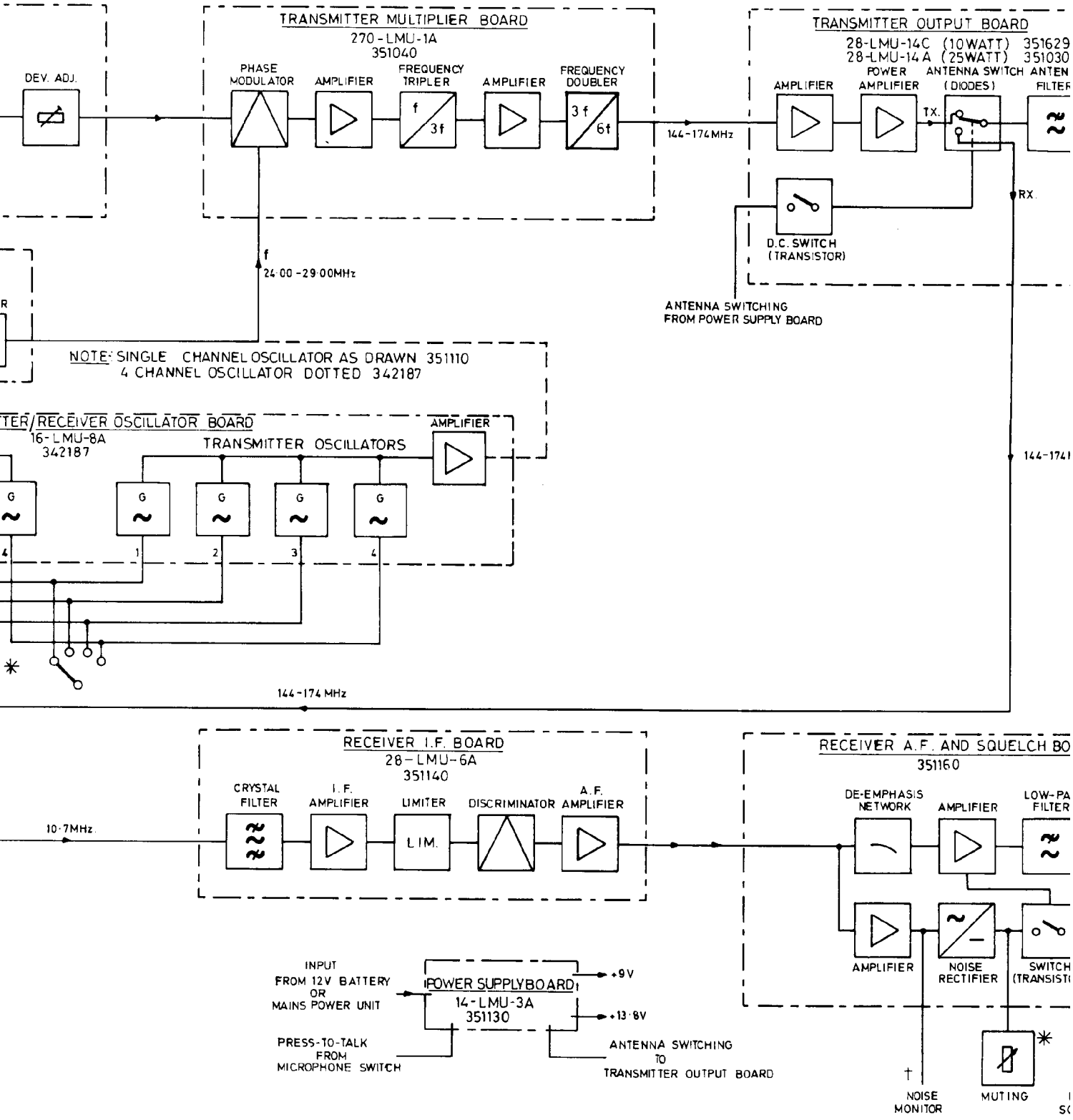
FIG 1



NOTES

✳ FOR EXTENDED MOUNTED UNITS THE EXTERNAL COMPONENTS ARE LOCATED ON A REMOTE CONTROL PANEL.

† OPTIONAL.



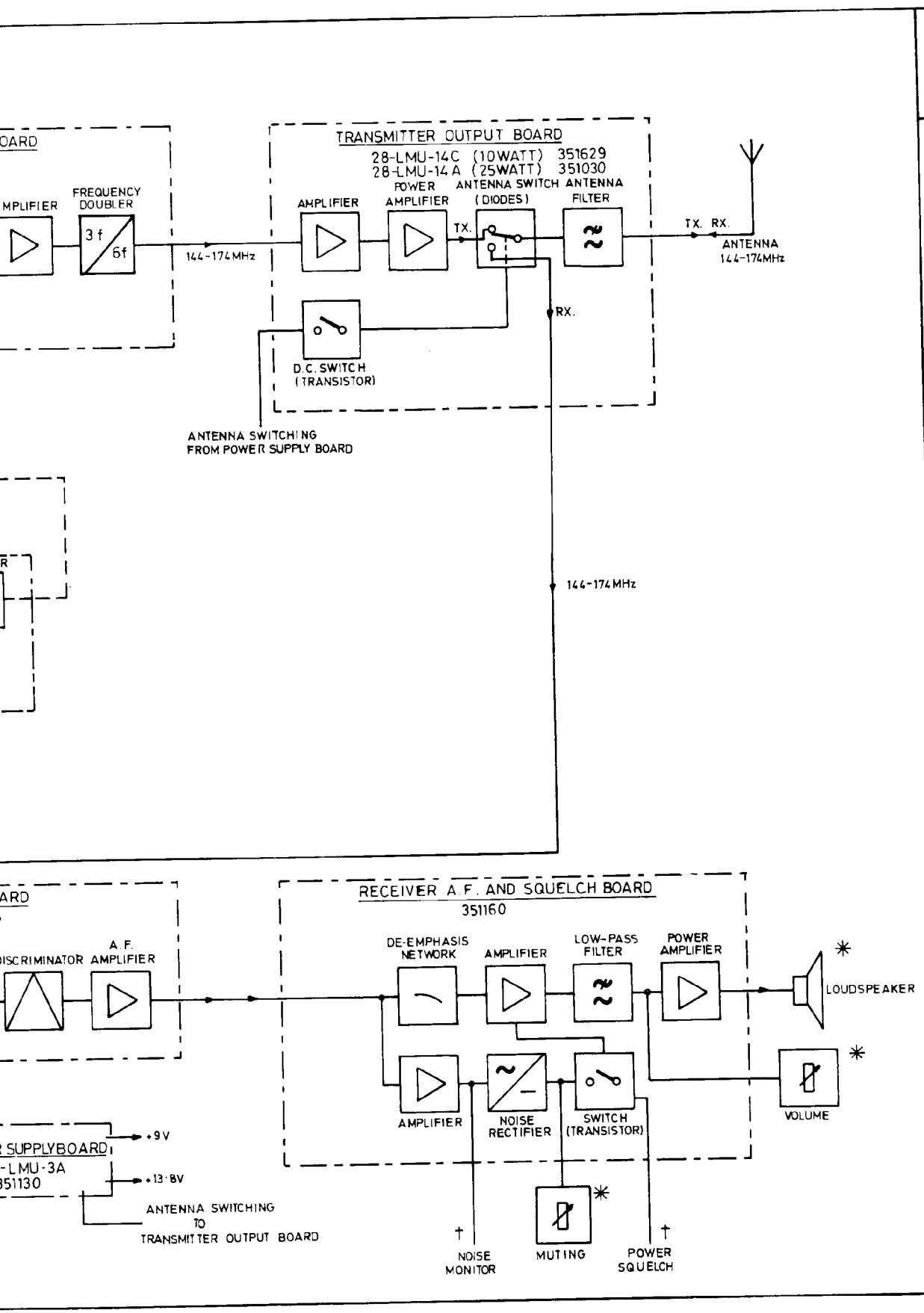
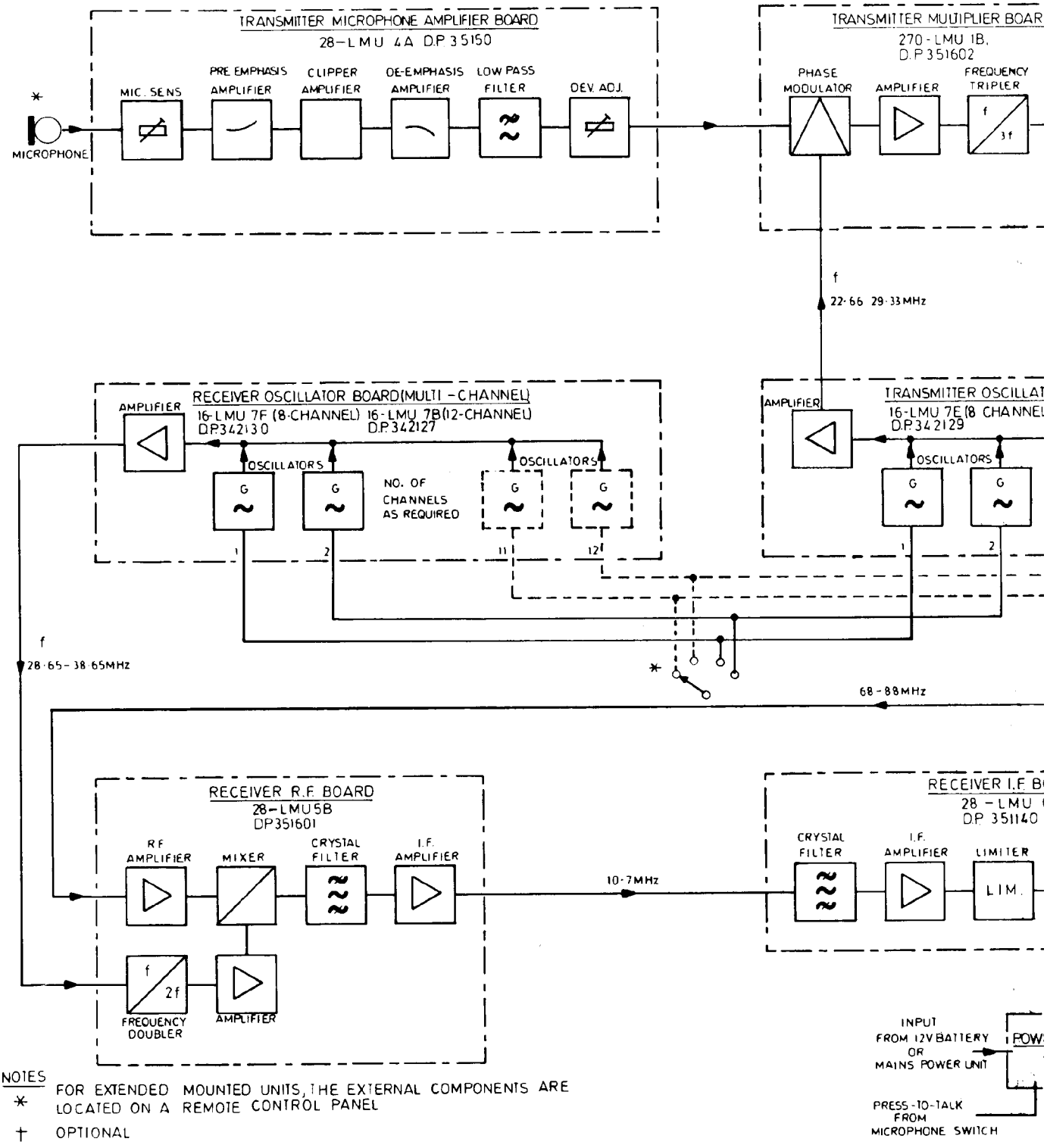


FIG 2

BLOCK DIAGRAM
SINGLE CHANNEL & 4 CHANNEL
HIGH BAND (144 174MHz)

FIG 2



NOTES

* FOR EXTENDED MOUNTED UNITS, THE EXTERNAL COMPONENTS ARE LOCATED ON A REMOTE CONTROL PANEL

† OPTIONAL

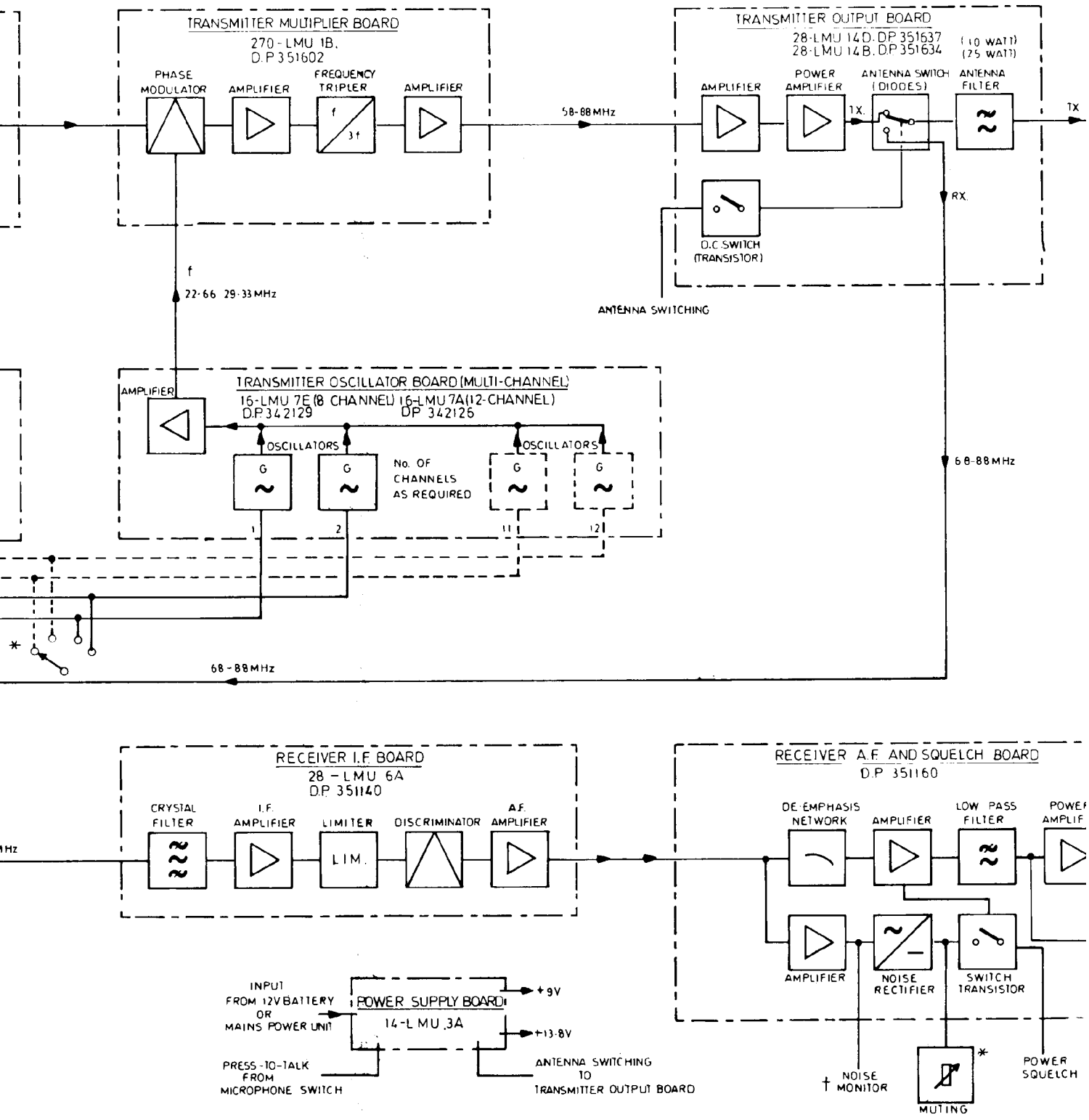


FIG. 3

BLOCK DIAGRAM
MULTI CHANNEL
LOW BAND (68-88MHz)

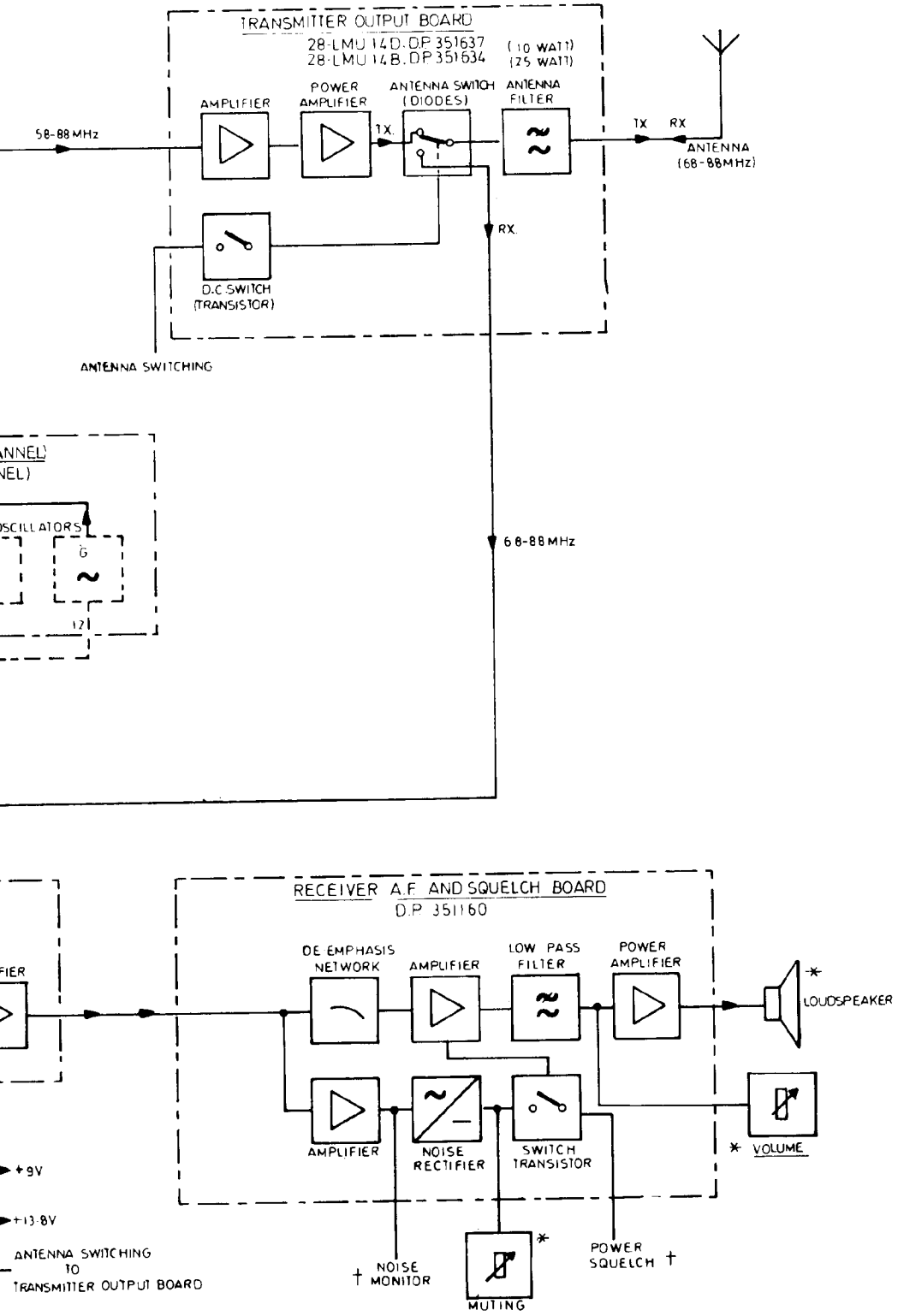
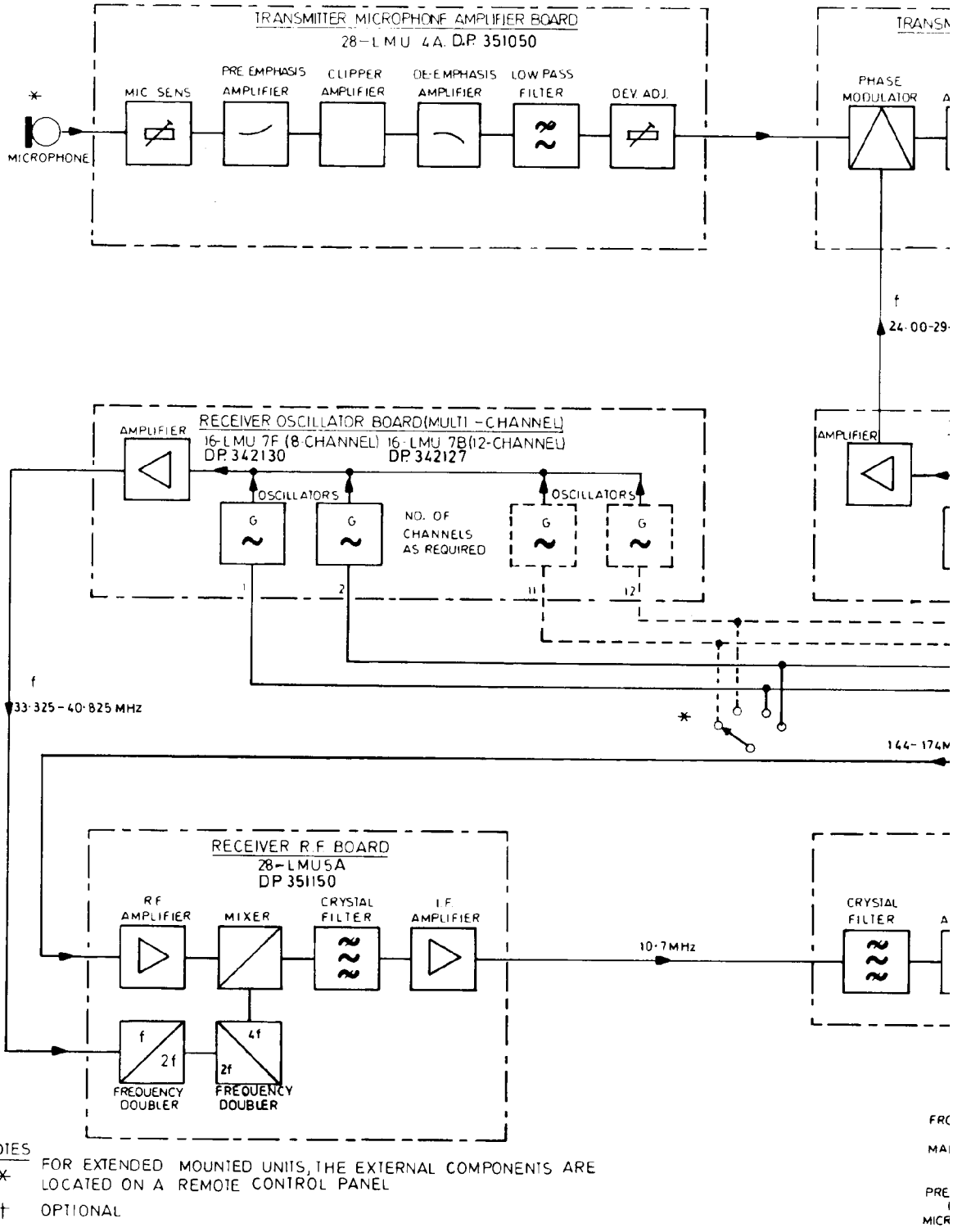


FIG. 3



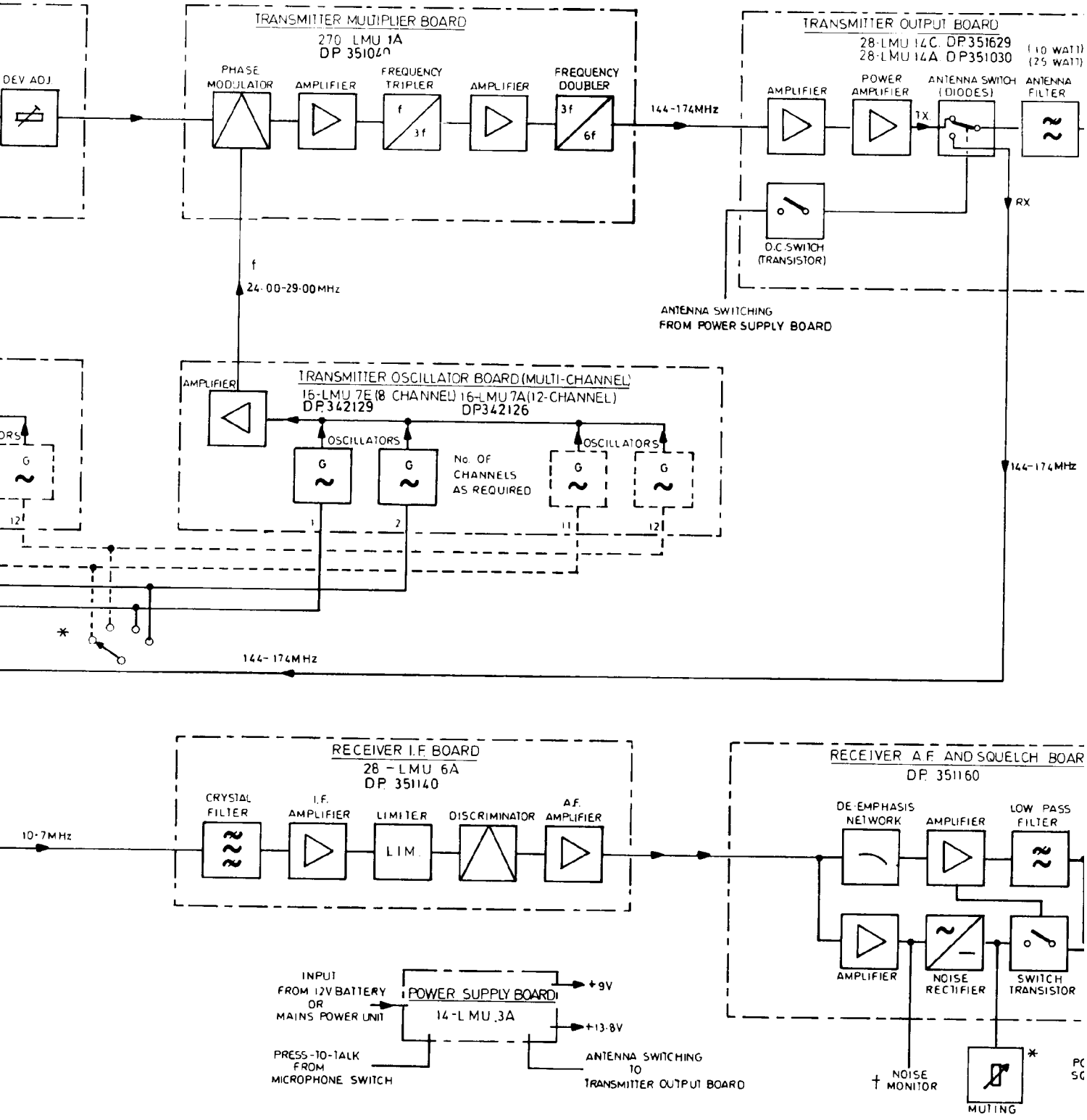
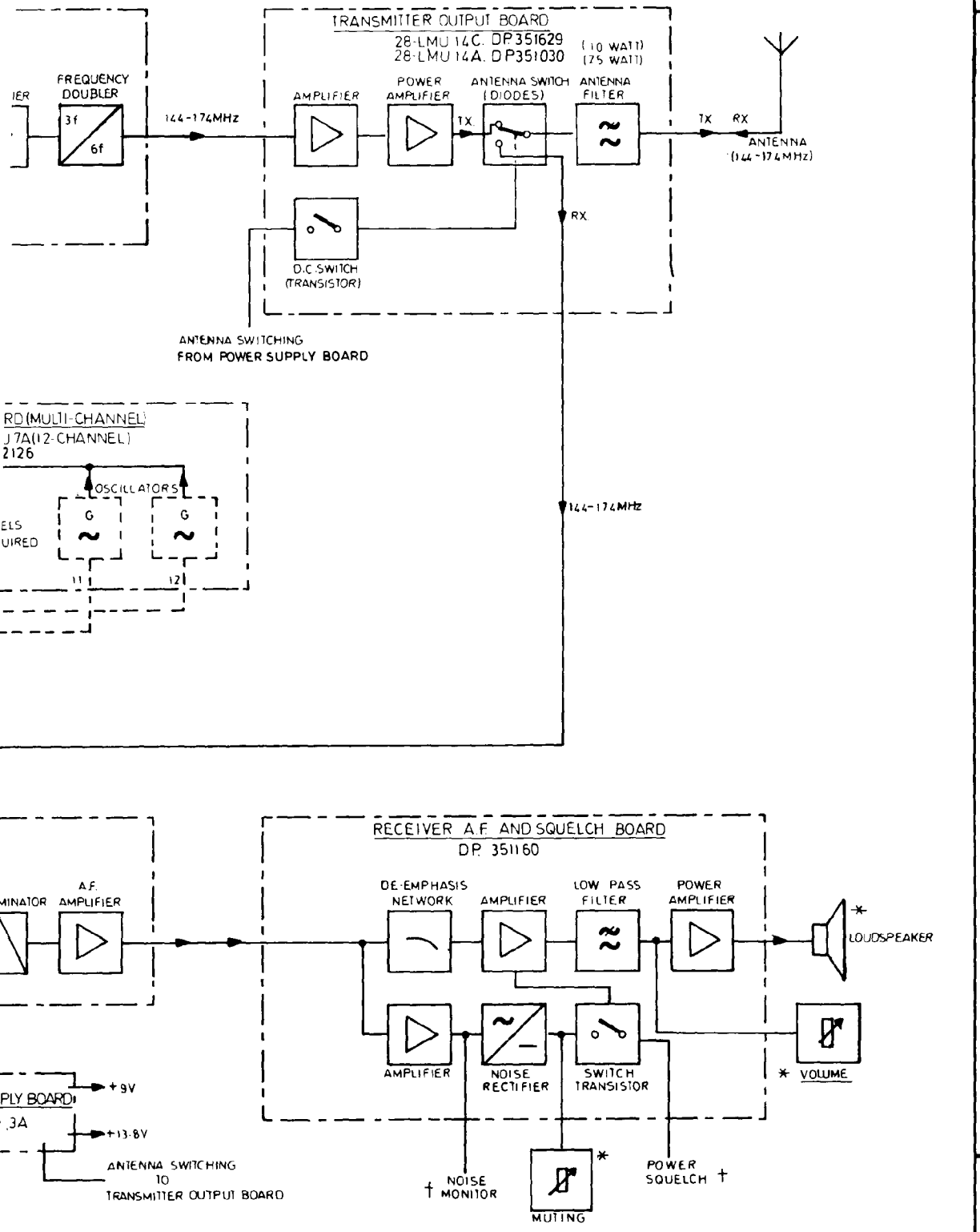
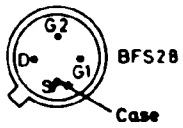


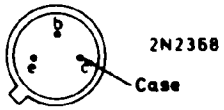
FIG. 4

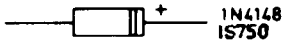


BLOCK DIAGRAM
MULTI CHANNEL
HIGH BAND (144-174MHz)

FIG. 4



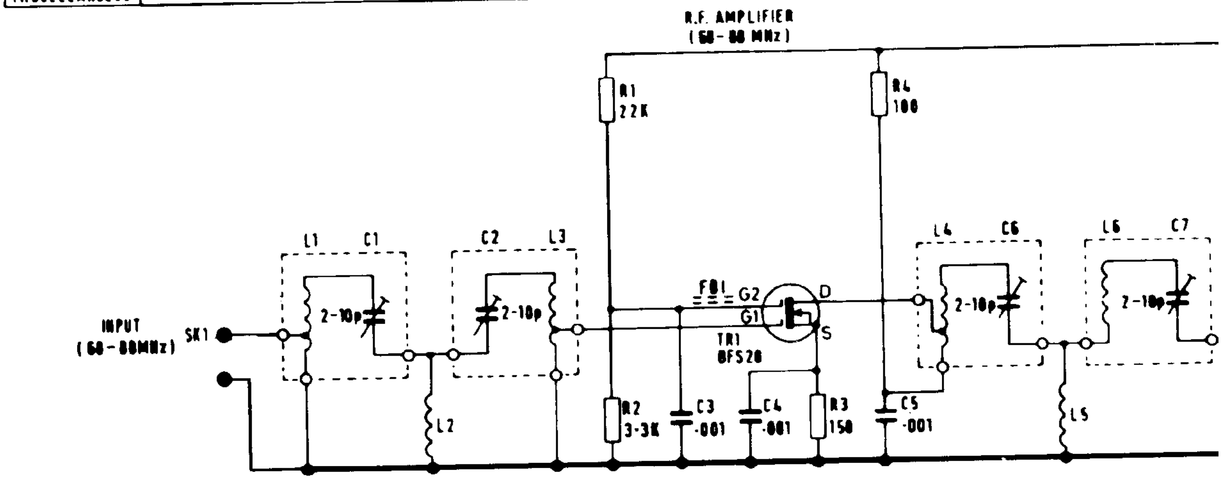


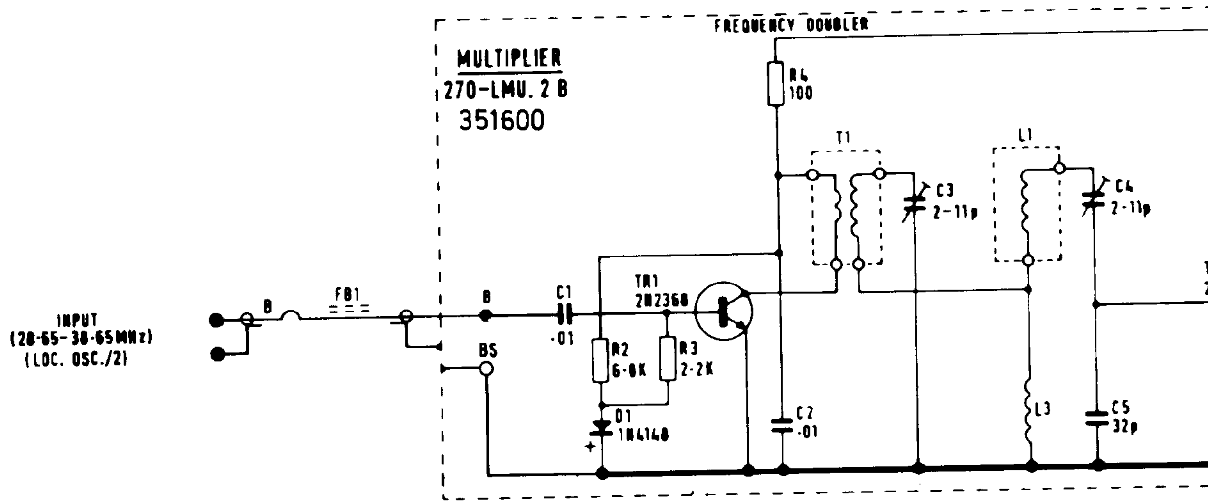


BAND INDICATES
CATHODE

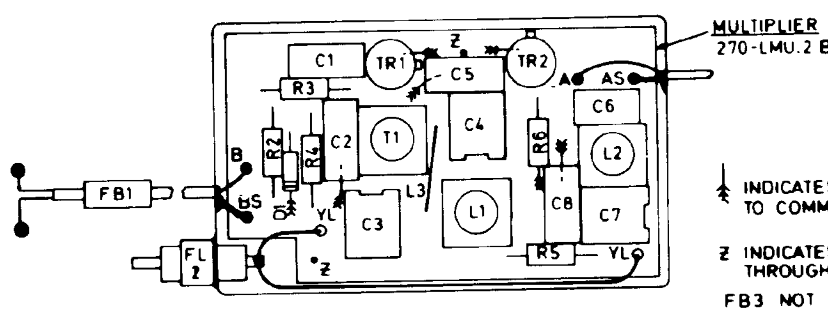
FM10
28-LMU.5 B
SHT. 7-2
ISS. 1

RESISTORS	2 3 4
CAPACITORS	1 2 3 4 5 6 7
MISCELLANEOUS	L1 L2 L3 FB1 TR1 L4 L5 L6





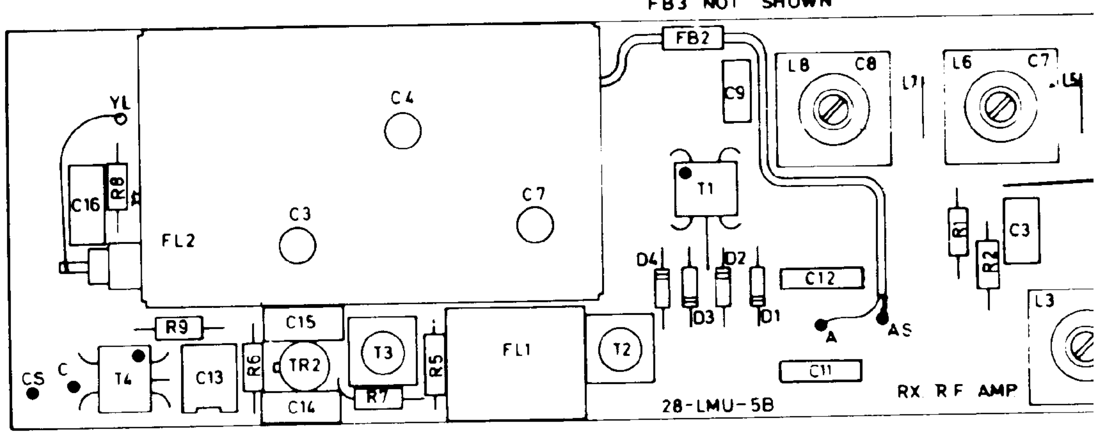
RESISTORS	2 3 4
CAPACITORS	1 2 3 4 5
MISCELLANEOUS	FB1 D1 TR1 T1 L1 L3

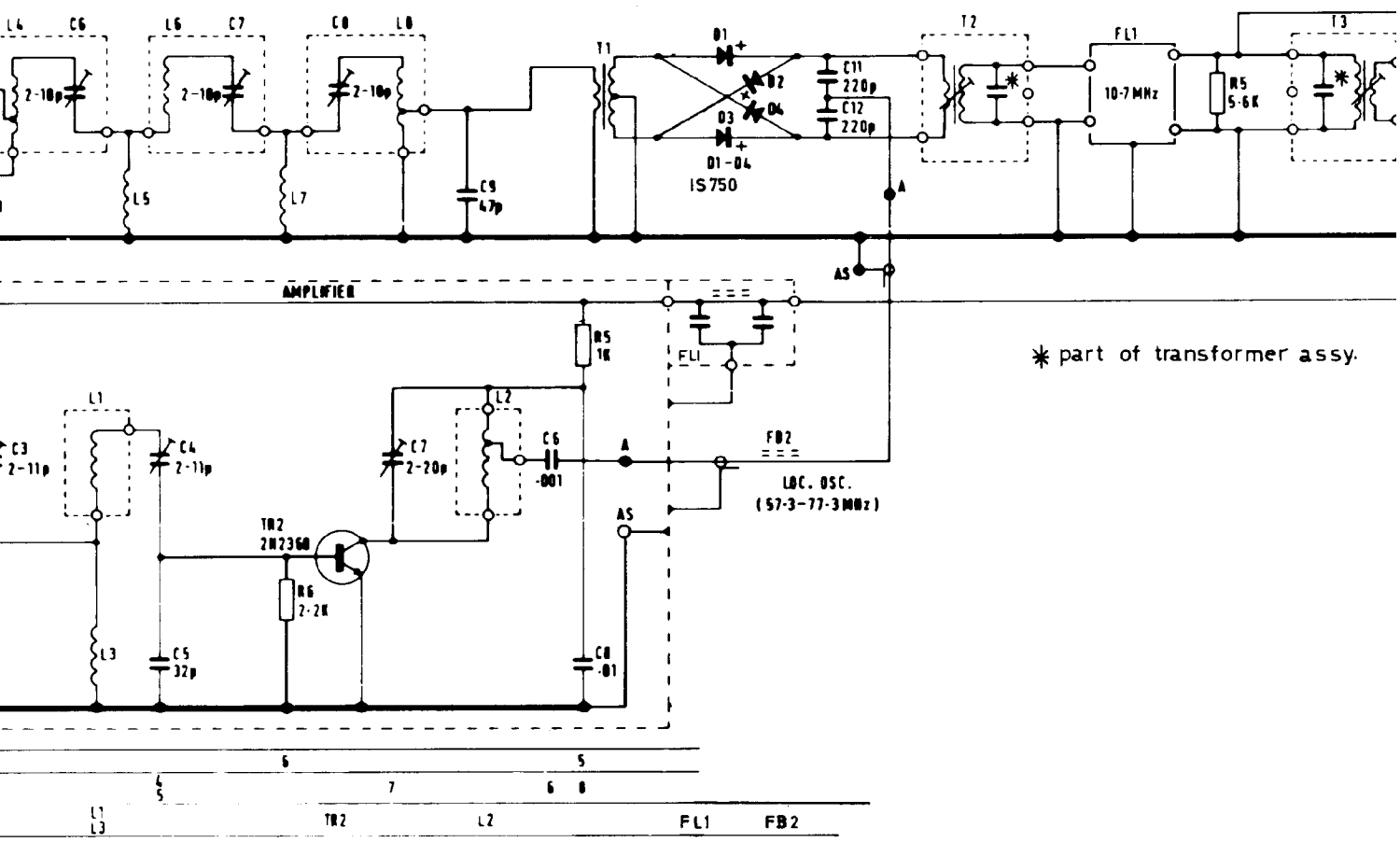


INDICATES CONNEXION TO COMMON NEG. PLANE

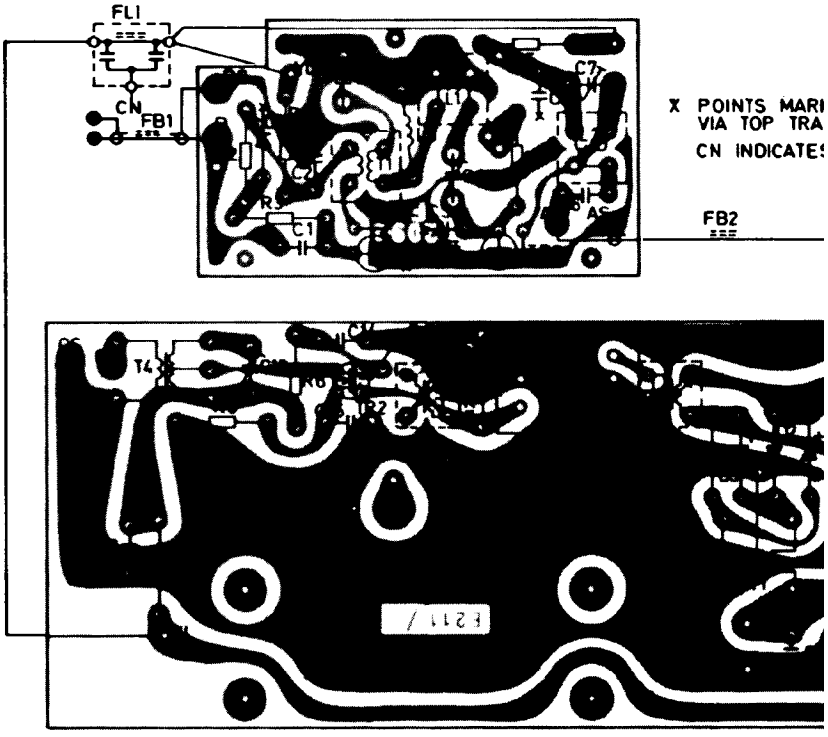
Z INDICATES LINK THROUGH BOARD

FB3 NOT SHOWN





* part of transformer assy.



X POINTS MARI
VIA TOP TRA
CN INDICATE

NEXION
G. PLANE

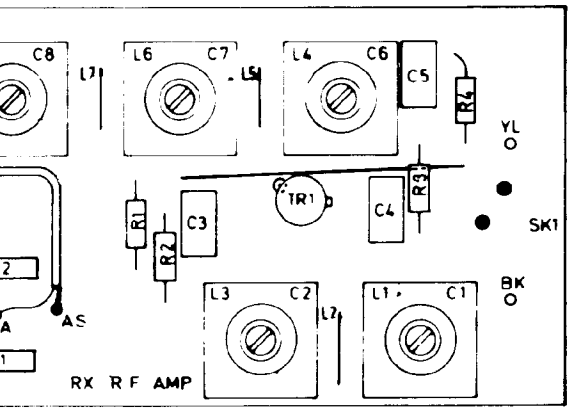
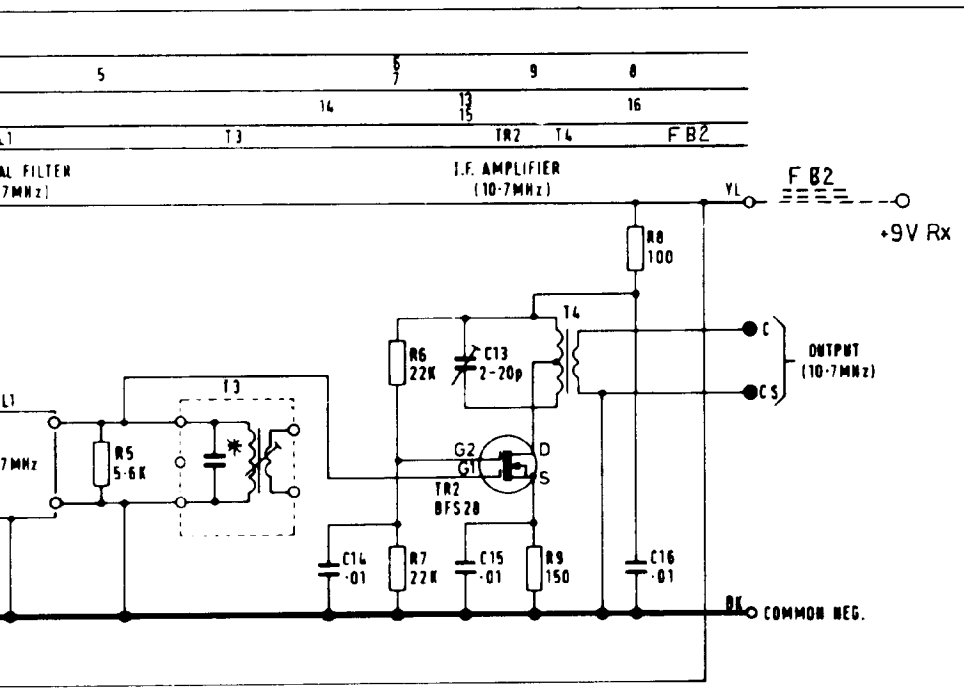
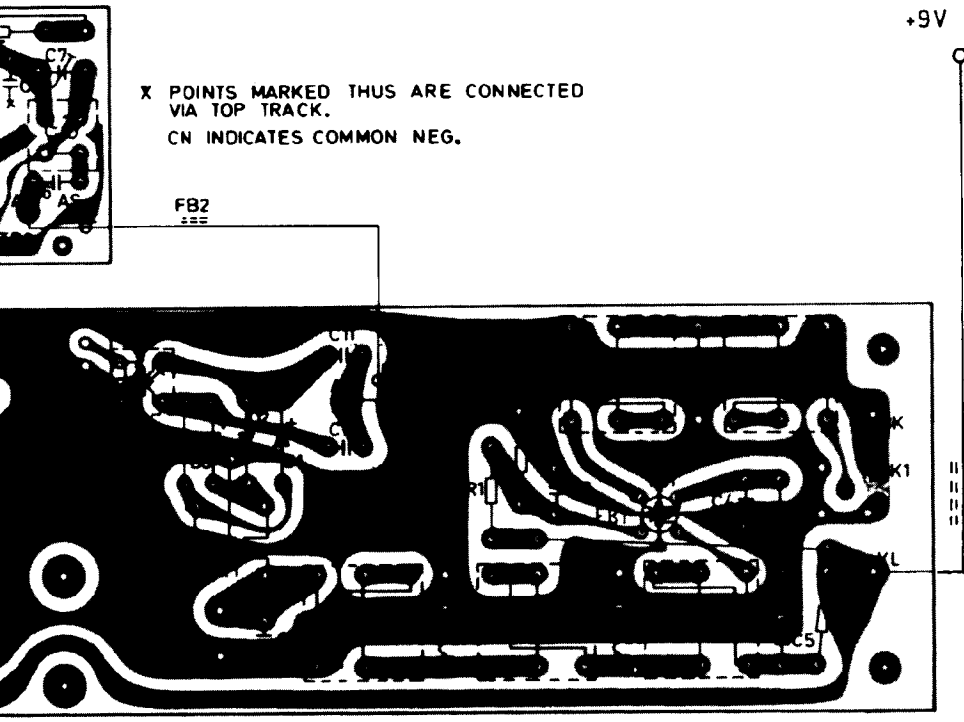


FIG. 5



of transformer assy.

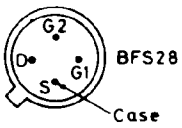


RECEIVER R.F. BOARD
LOW BAND

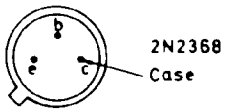
351601

28-LMU-5B

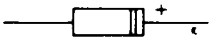
FIG. 5



BFS28



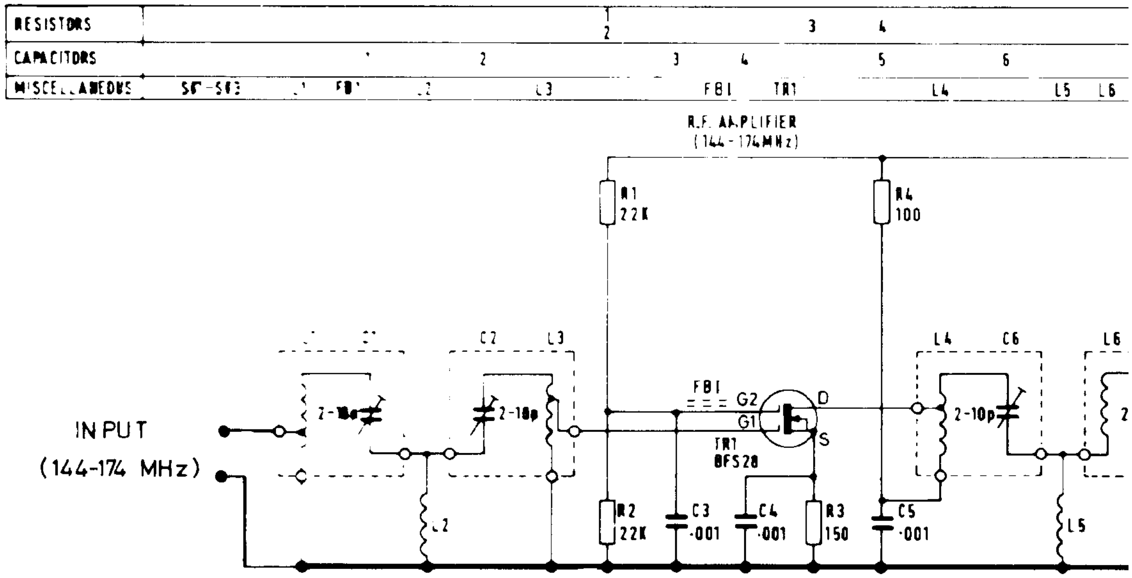
2N2368

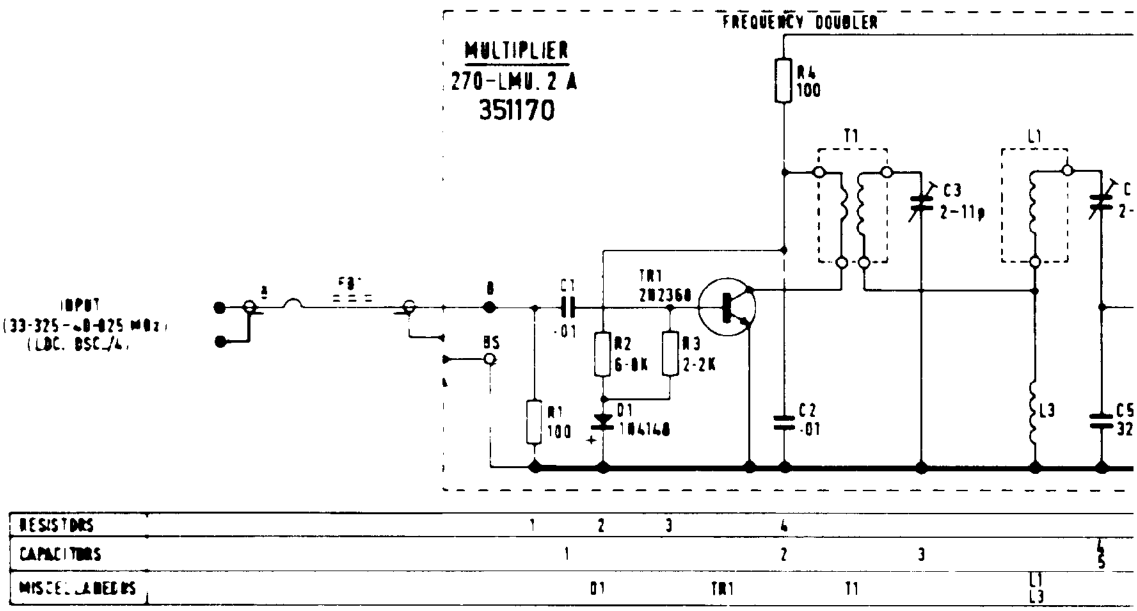


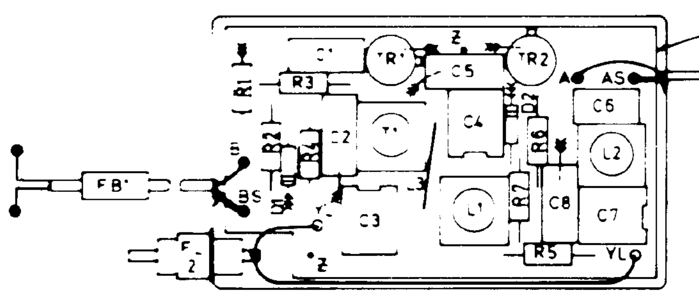
1N4148
1S750

BAND INDICATES CATHODE

FM10
28-LMU.5 A
SHT.7-1
ISS.1



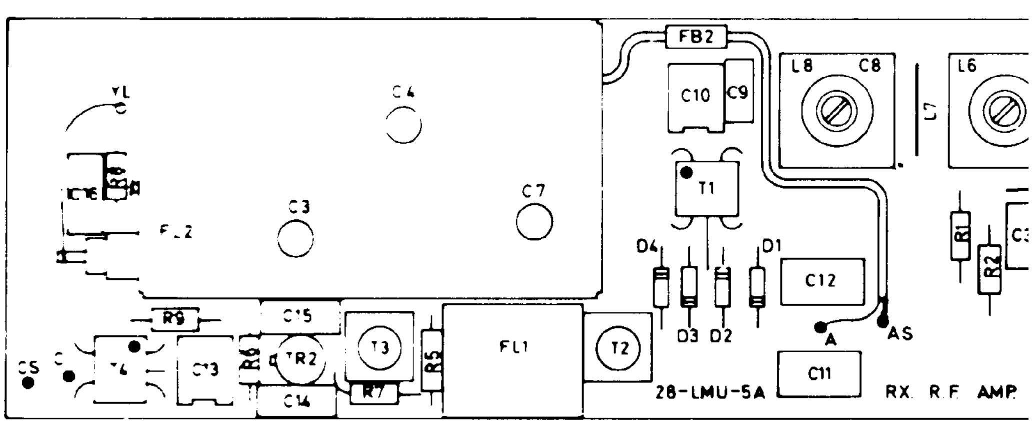


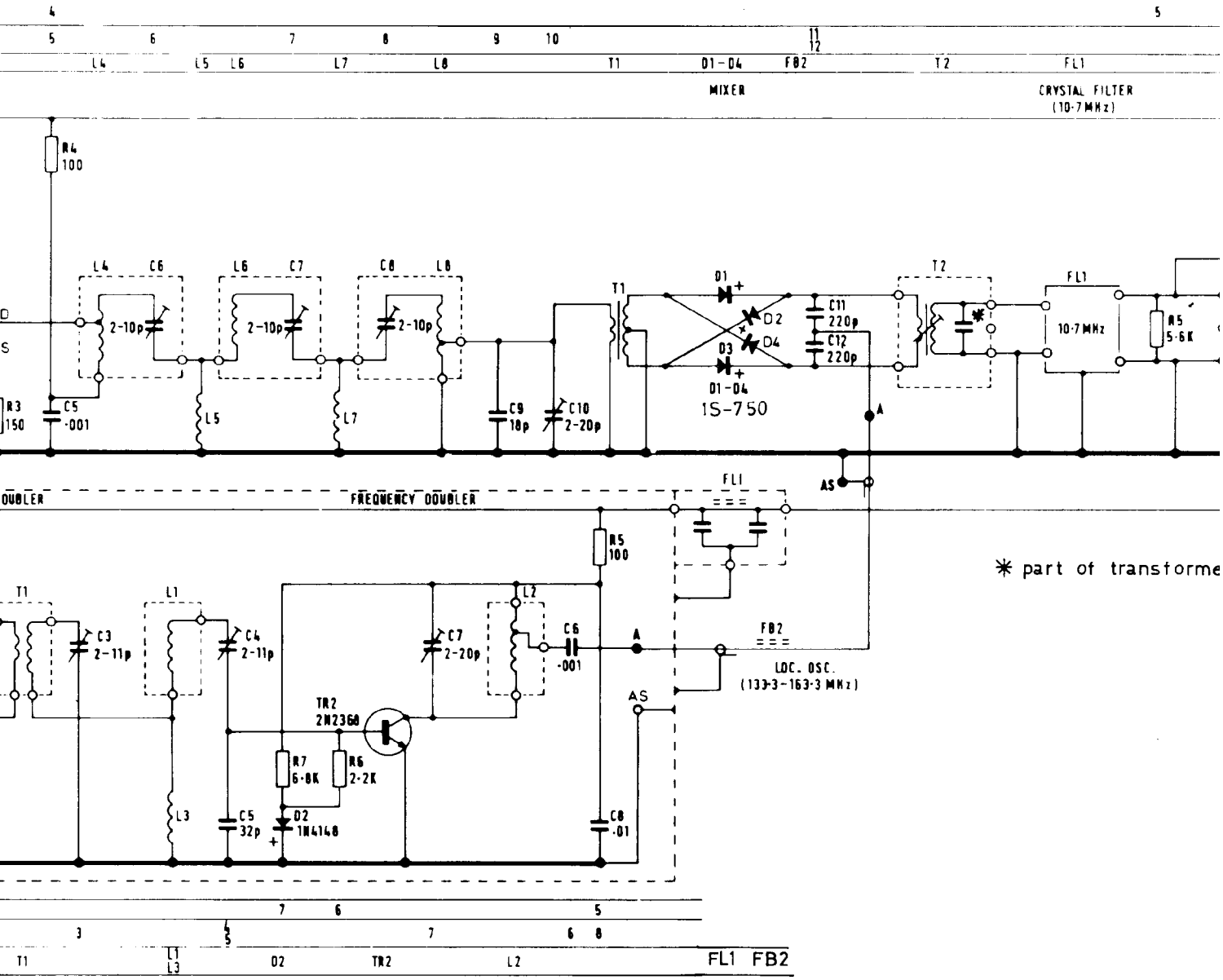


INDICATES CONNEXION TO COMMON NEG. PLANE

Z INDICATES LINK THROUGH BOARD

FB3 NOT SHOWN





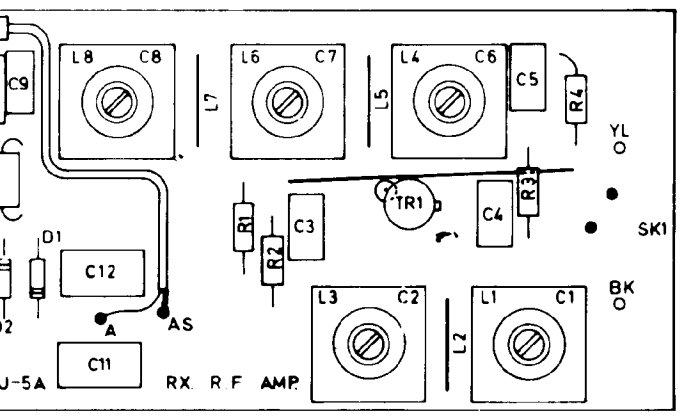
✳ part of transforme

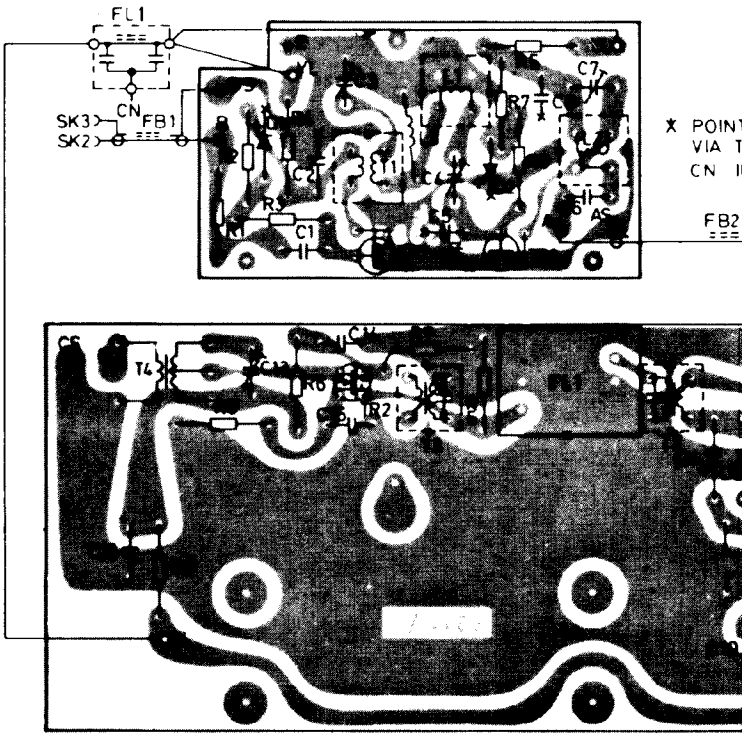
IER
U.2A

ICATES CONNEXION
COMMON NEG. PLANE

DICATES LINK
ROUGH BOARD

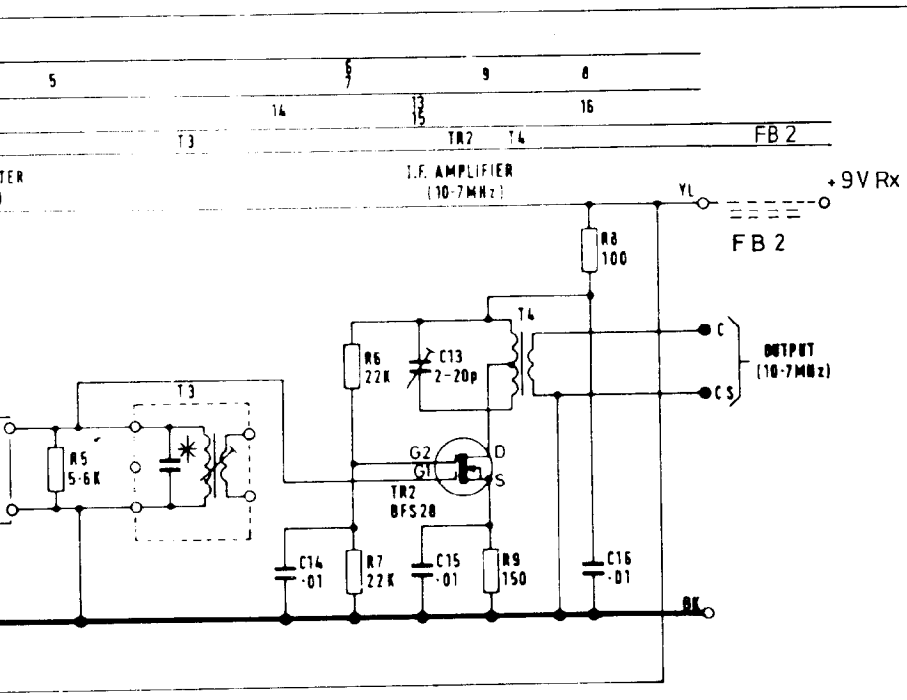
NOT SHOWN



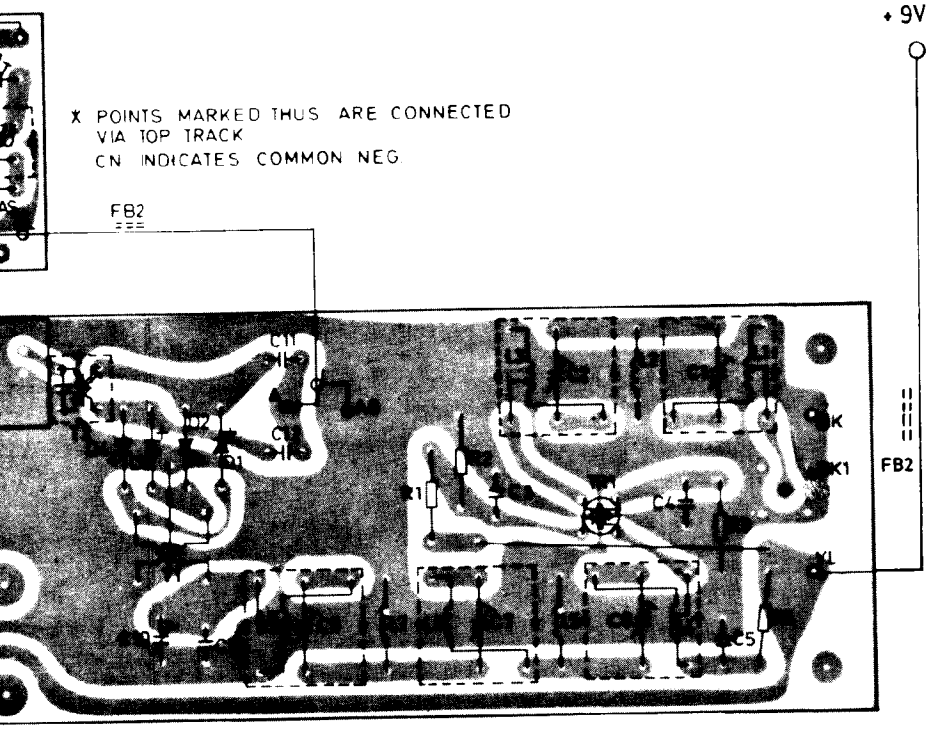


✳ POINT
VIA T
CN I

FB2



transformer assy.



RECEIVER R.F. BOARD

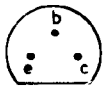
HIGH BAND

351150

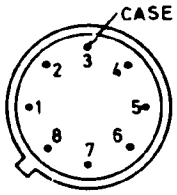
28-LMU-5A

FIG. 6

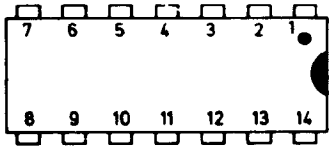
FIG. 6



BC214K



CA3028A

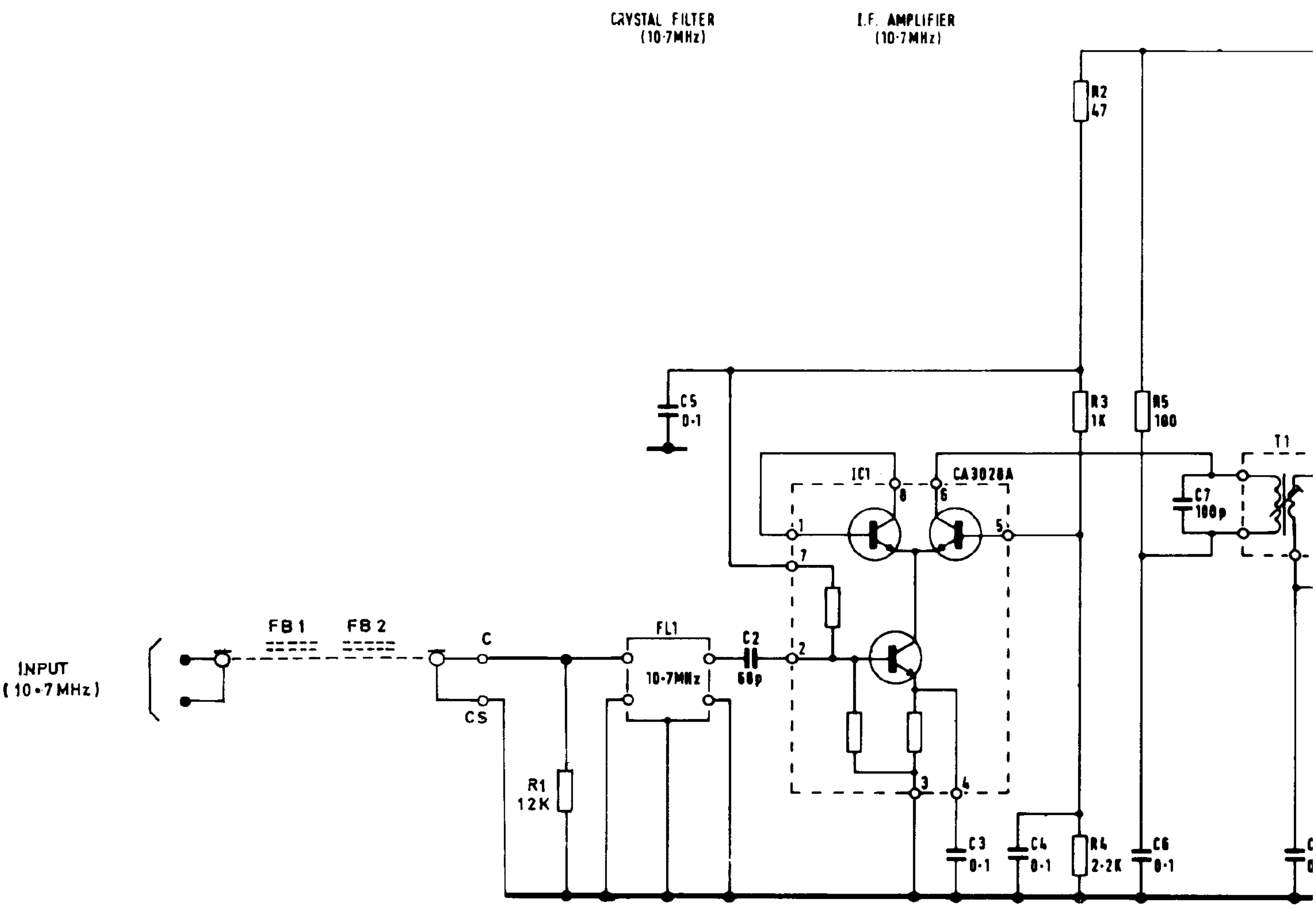


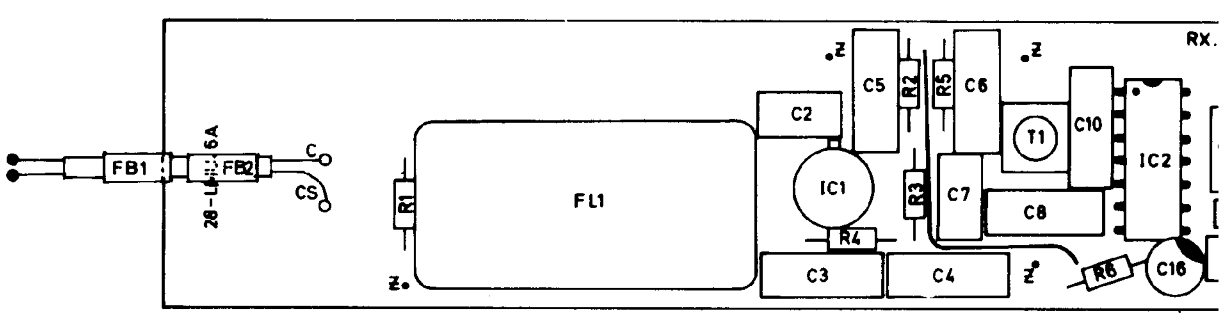
ULN 2111A

(VIEWED FROM TOP)

INPUT
(10·7 MHz)

RESISTORS	1						2 3 4	5		
CAPACITORS		5	2		3	4		6	7	8
MISCELLANEOUS	FB1 FB 2	FL1		IC1						T1





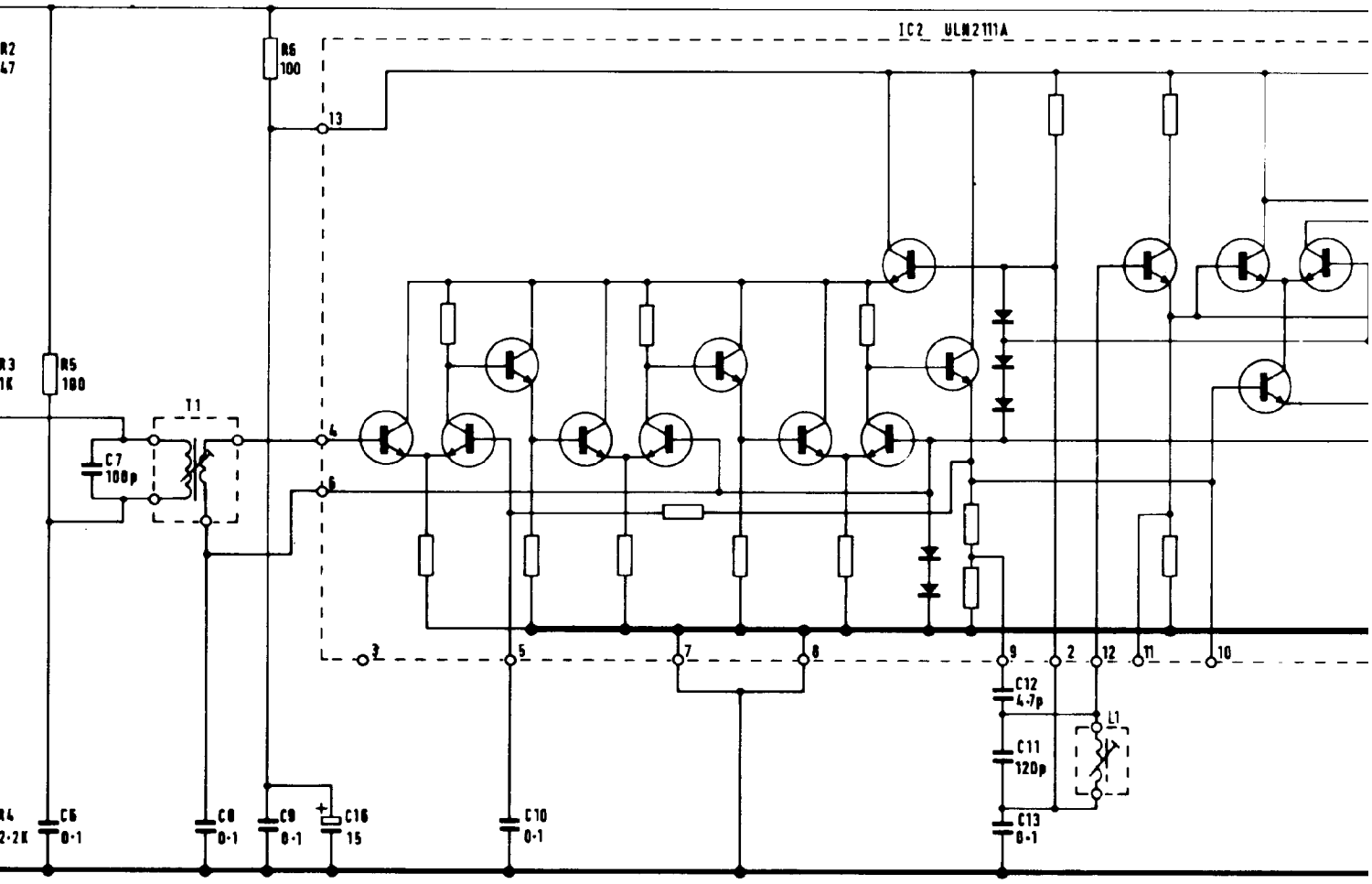
Ƶ INDICATES LINK THROUGH BOARD
A Ƶ LINK IS FITTED UNDER IC1

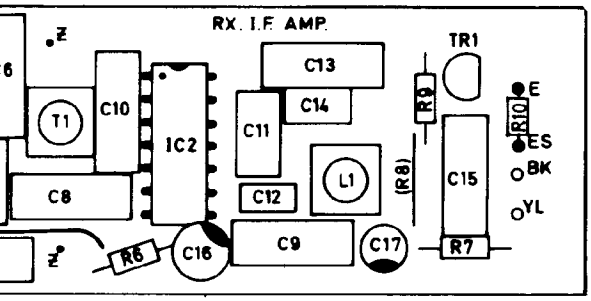
5 6

6 7 8 9 16 10 12 11 13

T1 IC2 L1

I.F. AMPLIFIER (10·7 MHz) LIMITER DISCRIMIN





LINK THROUGH BOARD
FITTED UNDER IC1

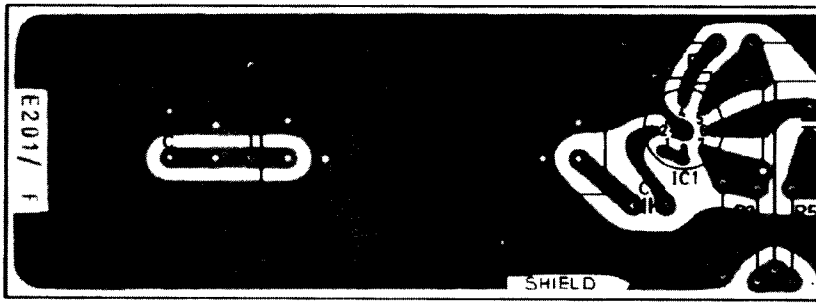
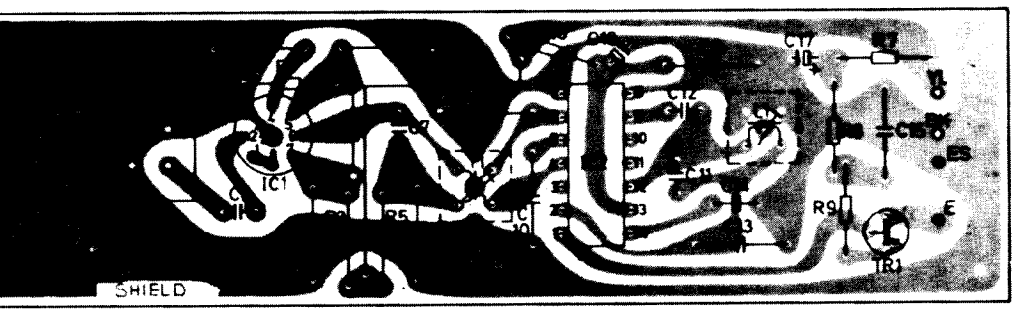


FIG. 7

7
8
9
14
15
17
L1
TR1

DISCRIMINATOR
A.F. AMPLIFIER
VL
+9V Rx
R7 27K
LINK
R9 1K
TR1 BC214K
E
ES
AUDIO & NOISE OUTPUT
9
2
12
11
10
14
C12 4·7p
L1
C11 120p
C13 0·1
C14 ·001
R10 4·7K
C17 0·47
BK
Common neg



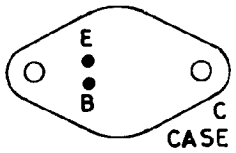
351140

RECEIVER I.F. BOARD

28-LMU-6A

FIG. 7

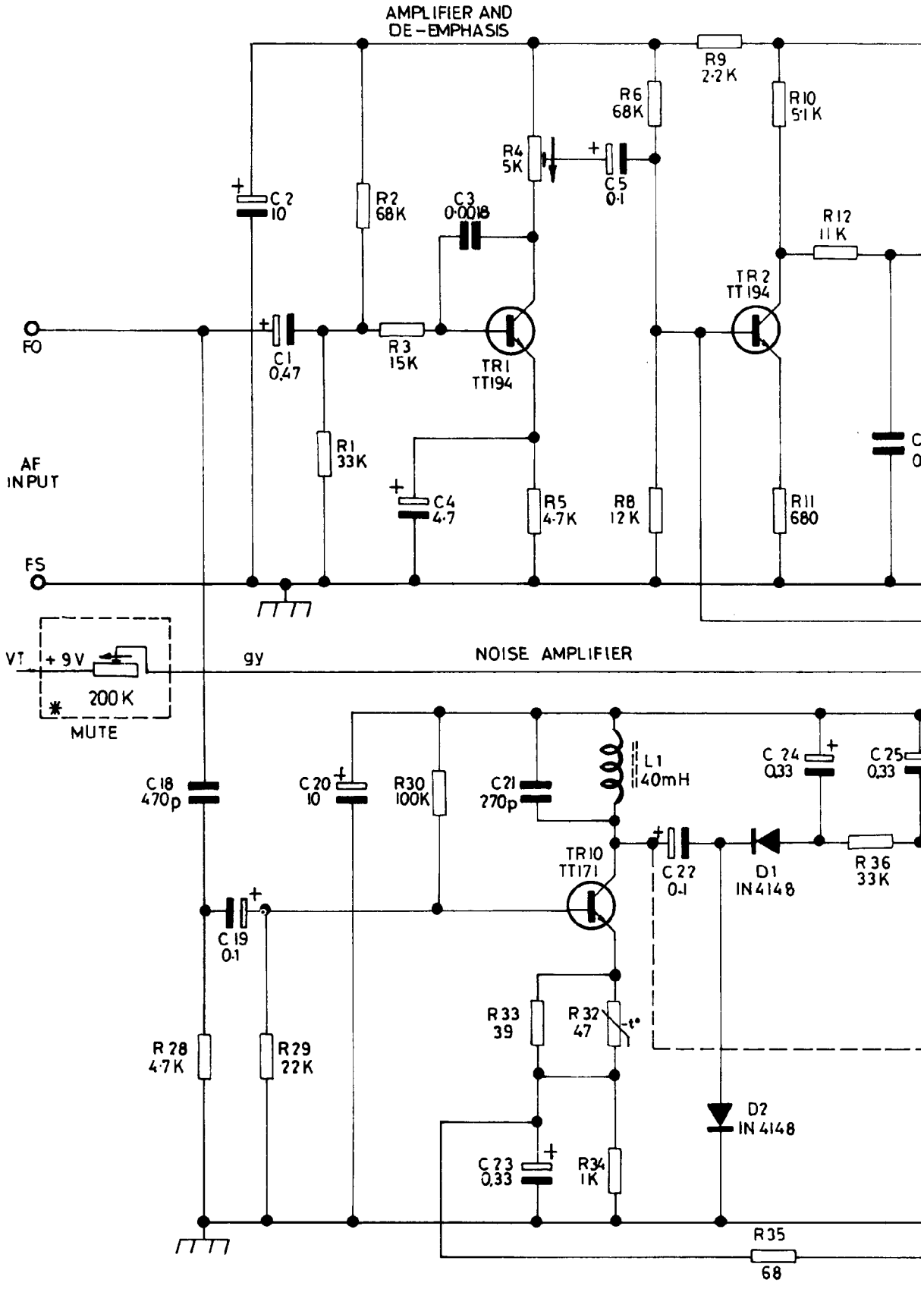
TT 194 TR1, TR2, TR3.
TT 171 TR4, TR5, TR 6, TR10, TR11, TR12
TT 212 TR7



TT 8140 TR 28, TR 29

TAG CAPACITOR

RESISTORS	28 29 1 2 3 30 4 5 33 32 34 6 8 9 35 10 11 31 12 36
CAPACITORS	18 19 21 20 4 3 21 23 5 22 24 7 25
MISCELLANIOUS	TR1 TR10 L1 D2 TR2 D1



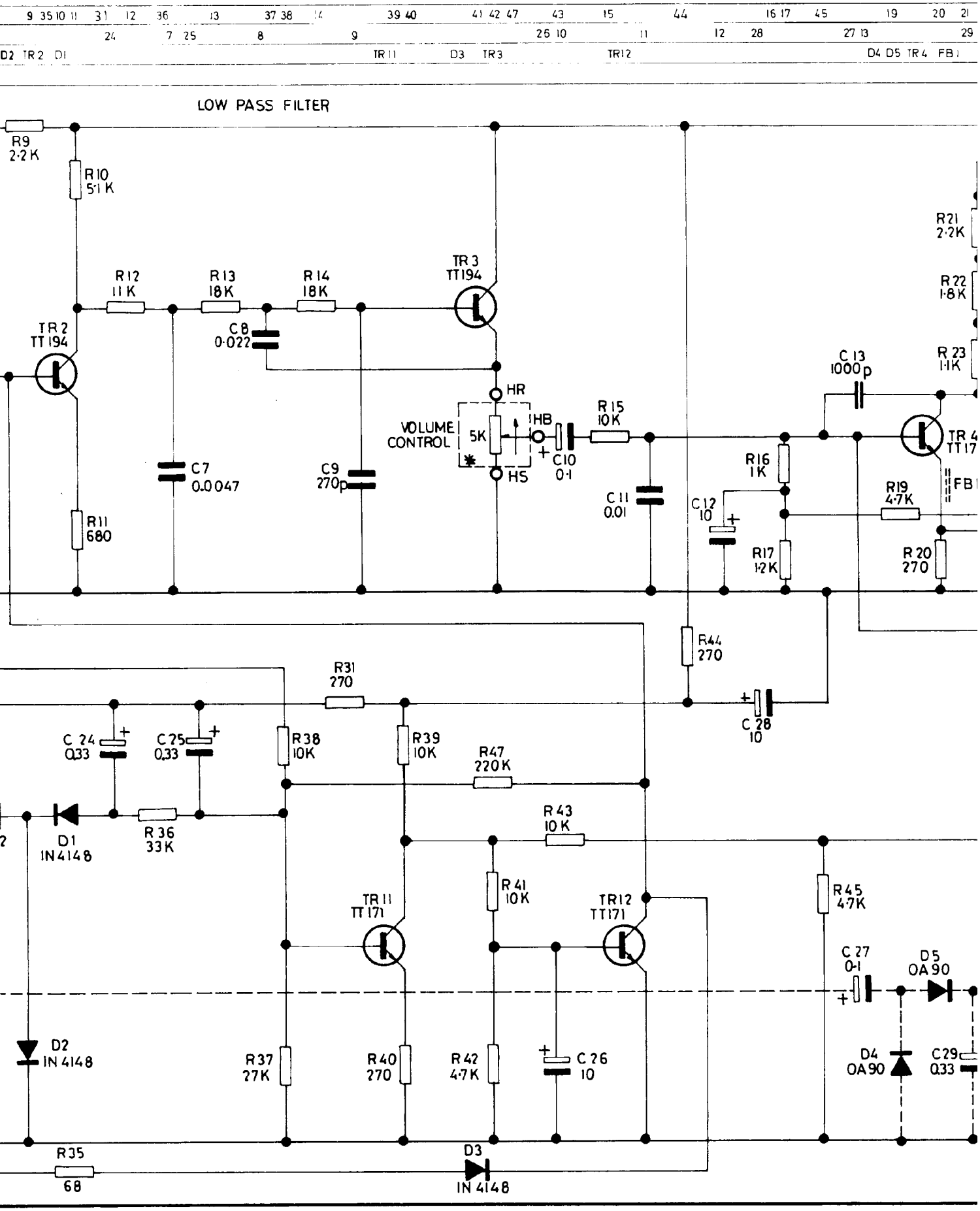


FIG 8

RECIVER AF AND SQUELCH BOARD 351160

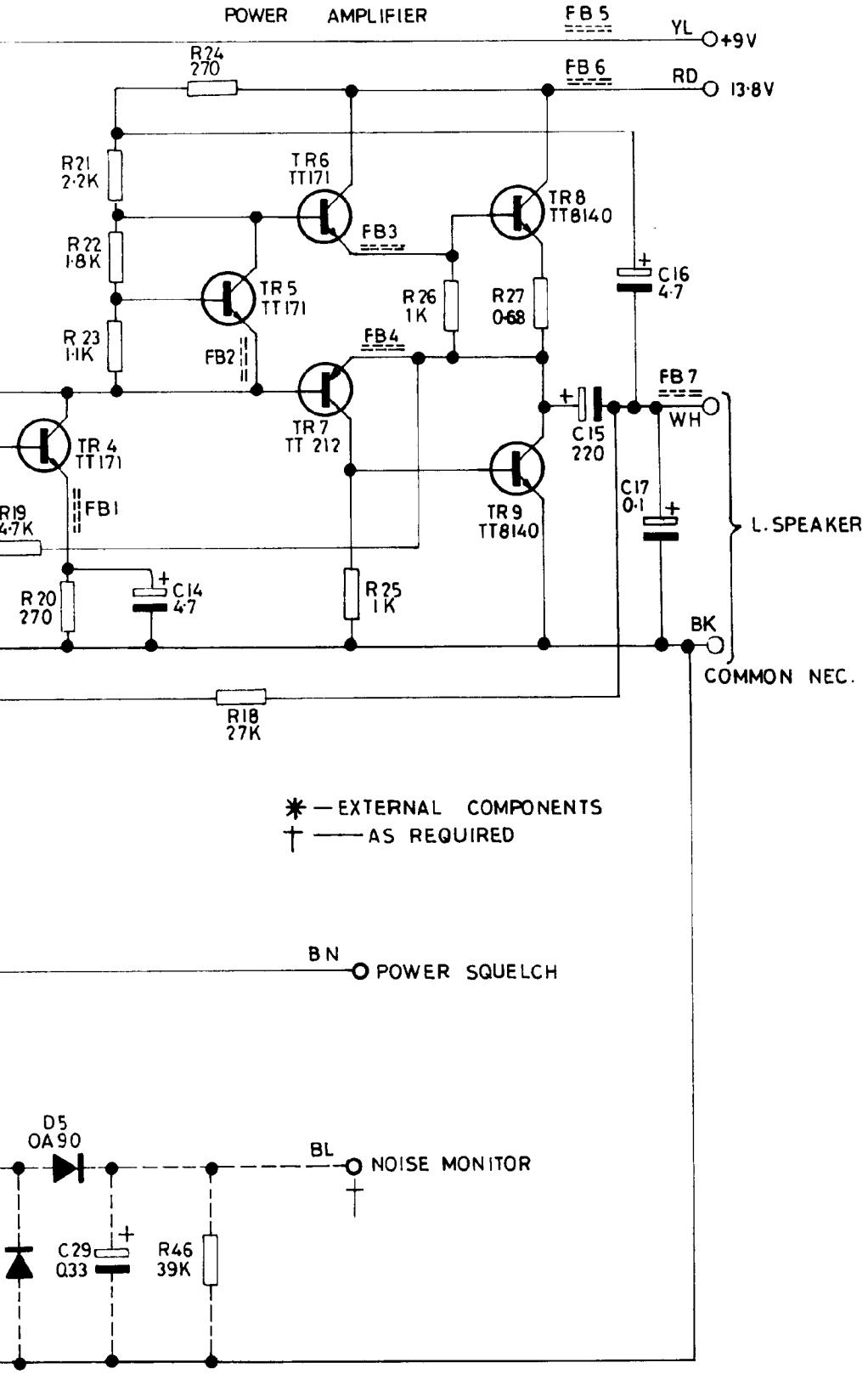
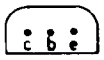


FIG 8

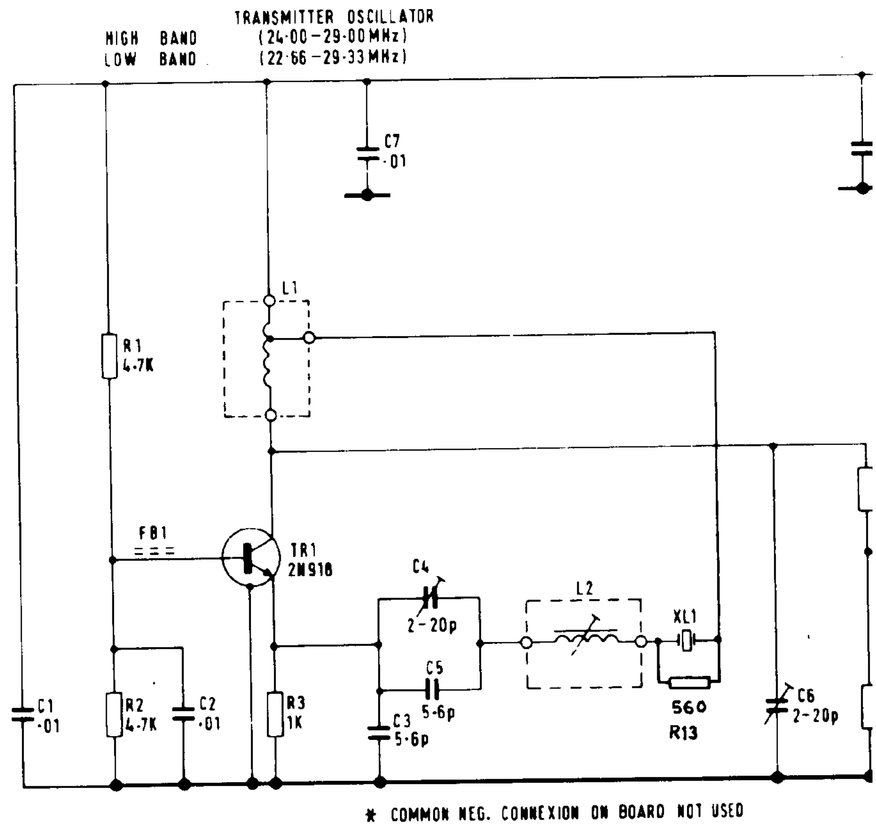
2N918

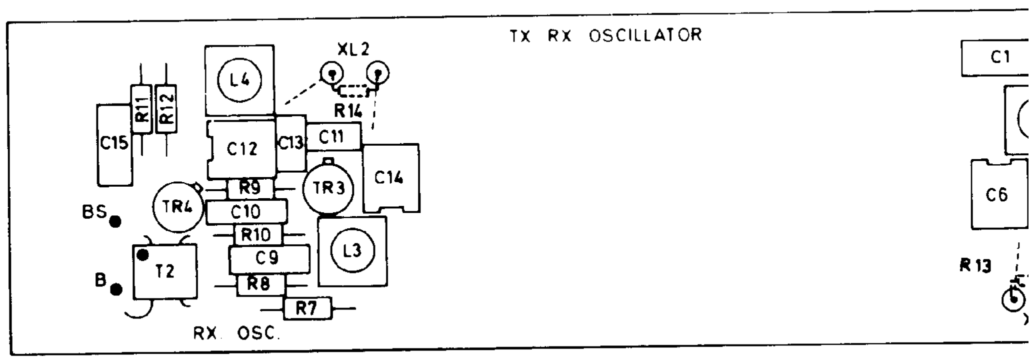


ZTX320

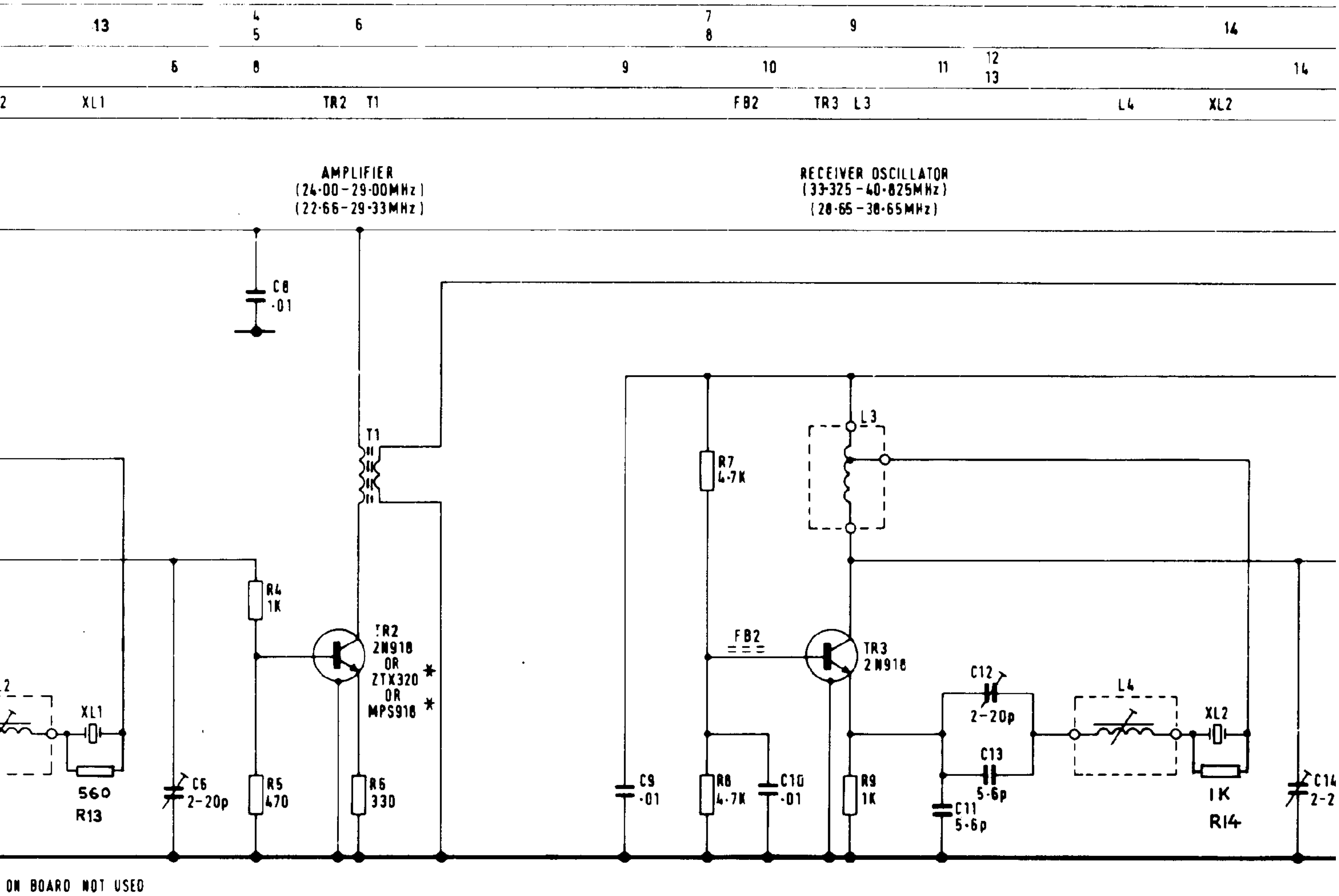
MPS918

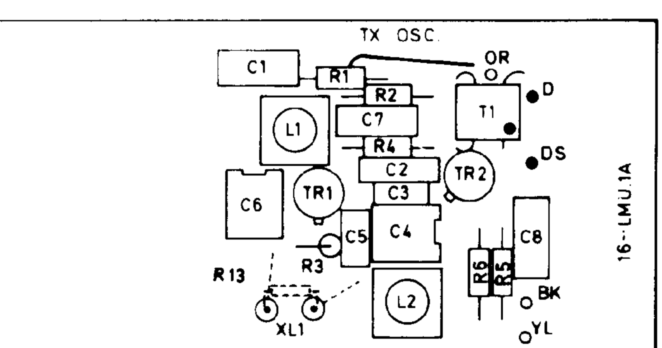
RESISTORS		1 2			3				13		4 5
CAPACITORS	1		2			7 3	4 5			6	8
MISCELLANEOUS		FB1		TR1	L1			L2	XL1		





FB1 FITTED ON BASE LEAD OF TR1
FB2 " " " " " TR3





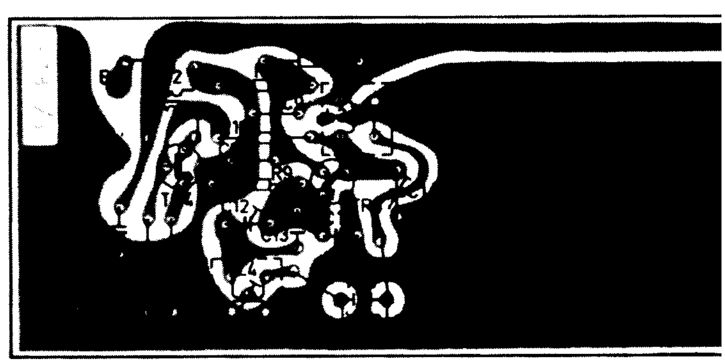
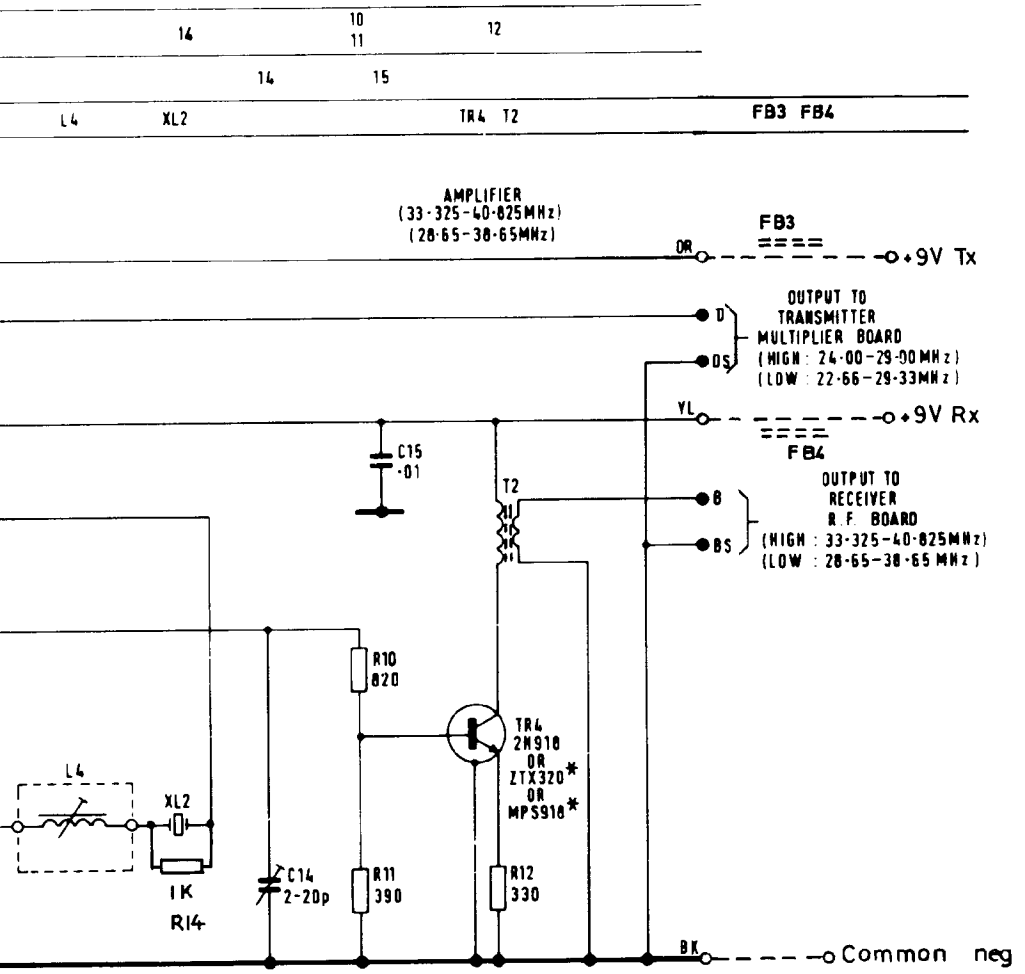
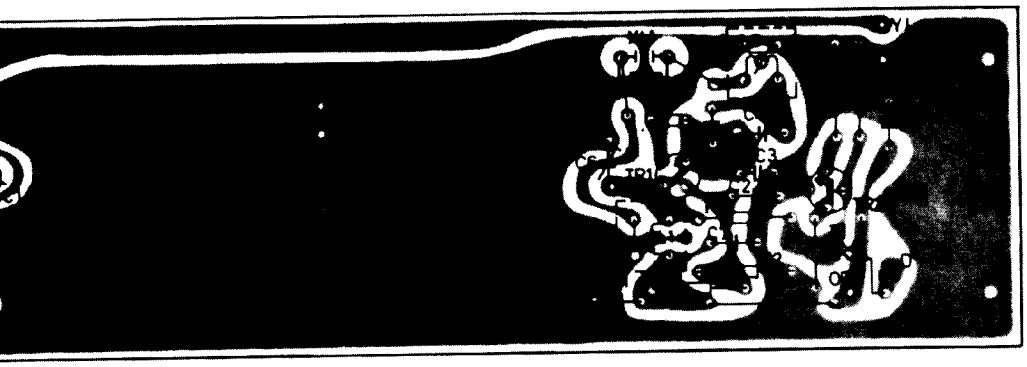


FIG. 9

TRANSMITTER/RECEIVER OSCILLATOR BOARD

351110





16-LMU-1A

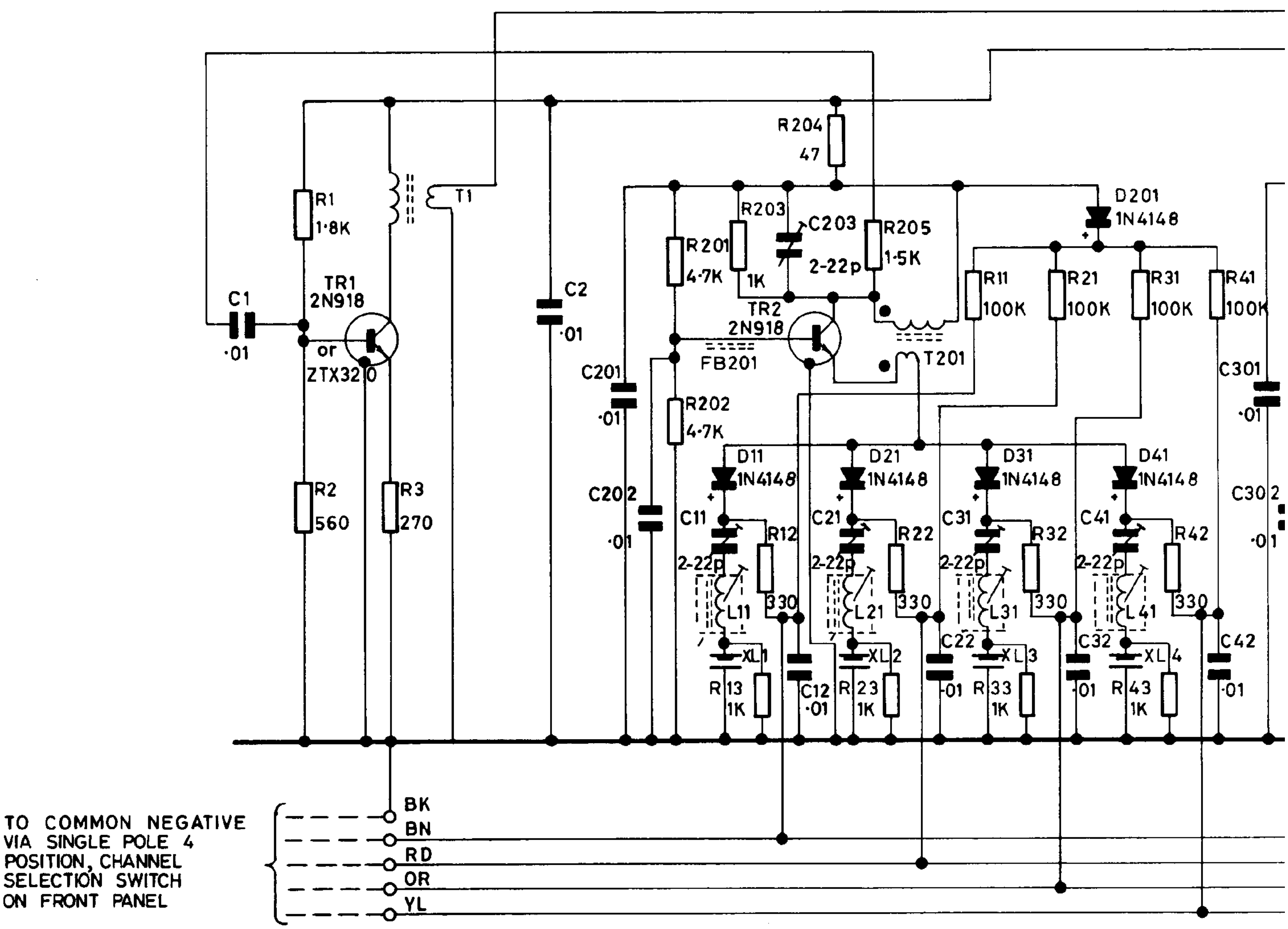
FIG. 9

SCHEM. REF.	GROUP A	GROUP B	GROUP C	GROUP D	GROUP E	GROUP F	GROUP G
R401	3·3K	4·7K	4·7K	3·3K	3·3K	3·3K	3·3K
R402	560	1K	1K	560	560	560	560
R403	150	100	100	150	150	150	150
C503			10p.	9p.	7·5p.	9p.	7·5p.
C504			12p.	10p.	9p.	10p.	9p.

RESISTORS
CAPACITORS
MISCELLANEOUS
DIODES

TO COMMON NEGATI
VIA SINGLE POLE 4
POSITION, CHANNEL
SELECTION SWITCH
ON FRONT PANEL

RESISTORS	1 2 3 201 202 203 12 13 204 205 22 23 11 21 32 33 31 42 43 41 301
CAPACITORS	1 2 201 202 11 203 12 21 22 31 32 41 42 301 3
MISCELLANEOUS	TR1 T1 TR2 FB201 L1 XL1 L21 XL2 T201 L31 XL3 L41 XL4
DIODES	11 21 31 41



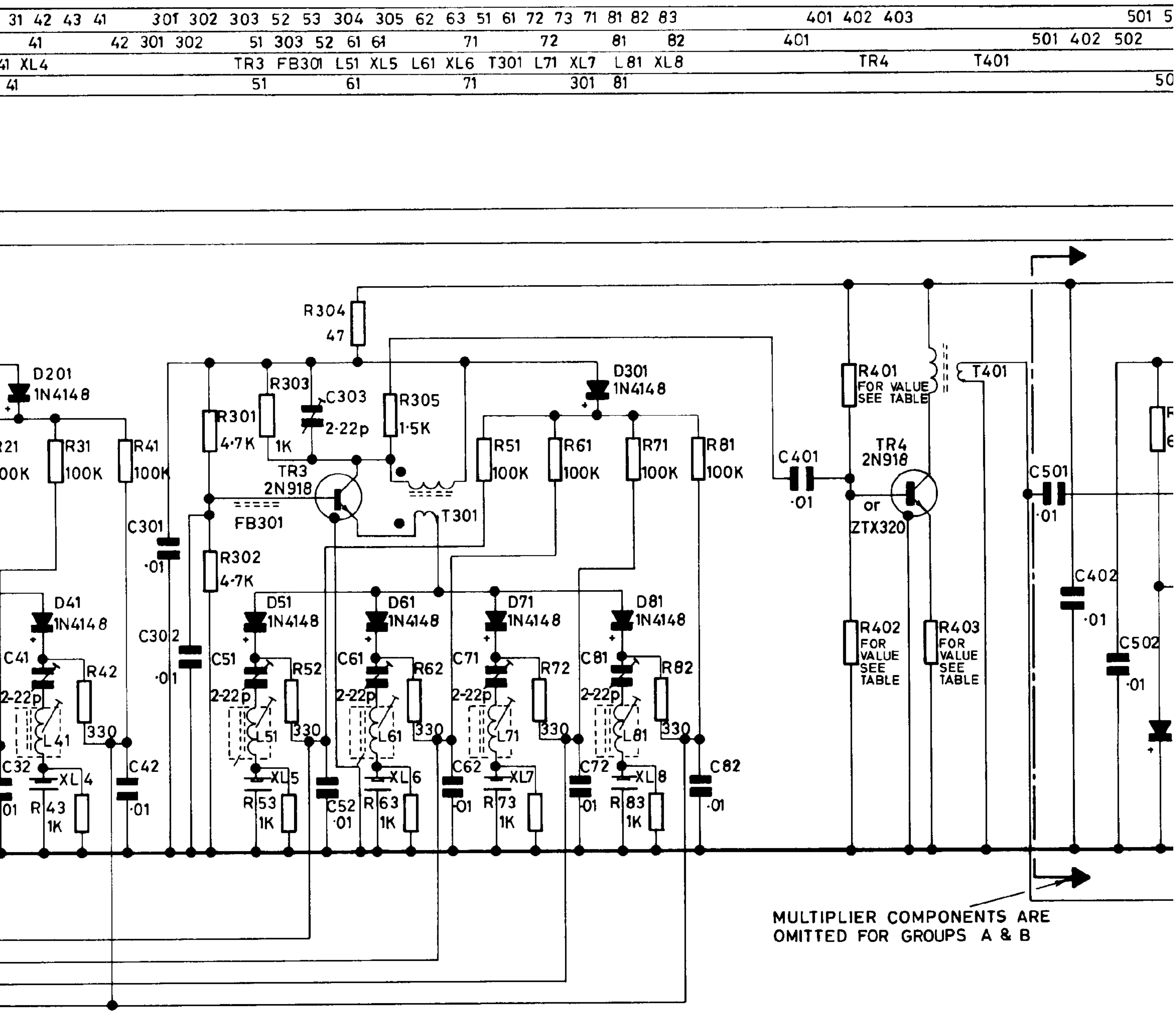


FIG. 10

D.P. 342187/93

OSCILLATOR BOARD

16-LMU-8. A-G

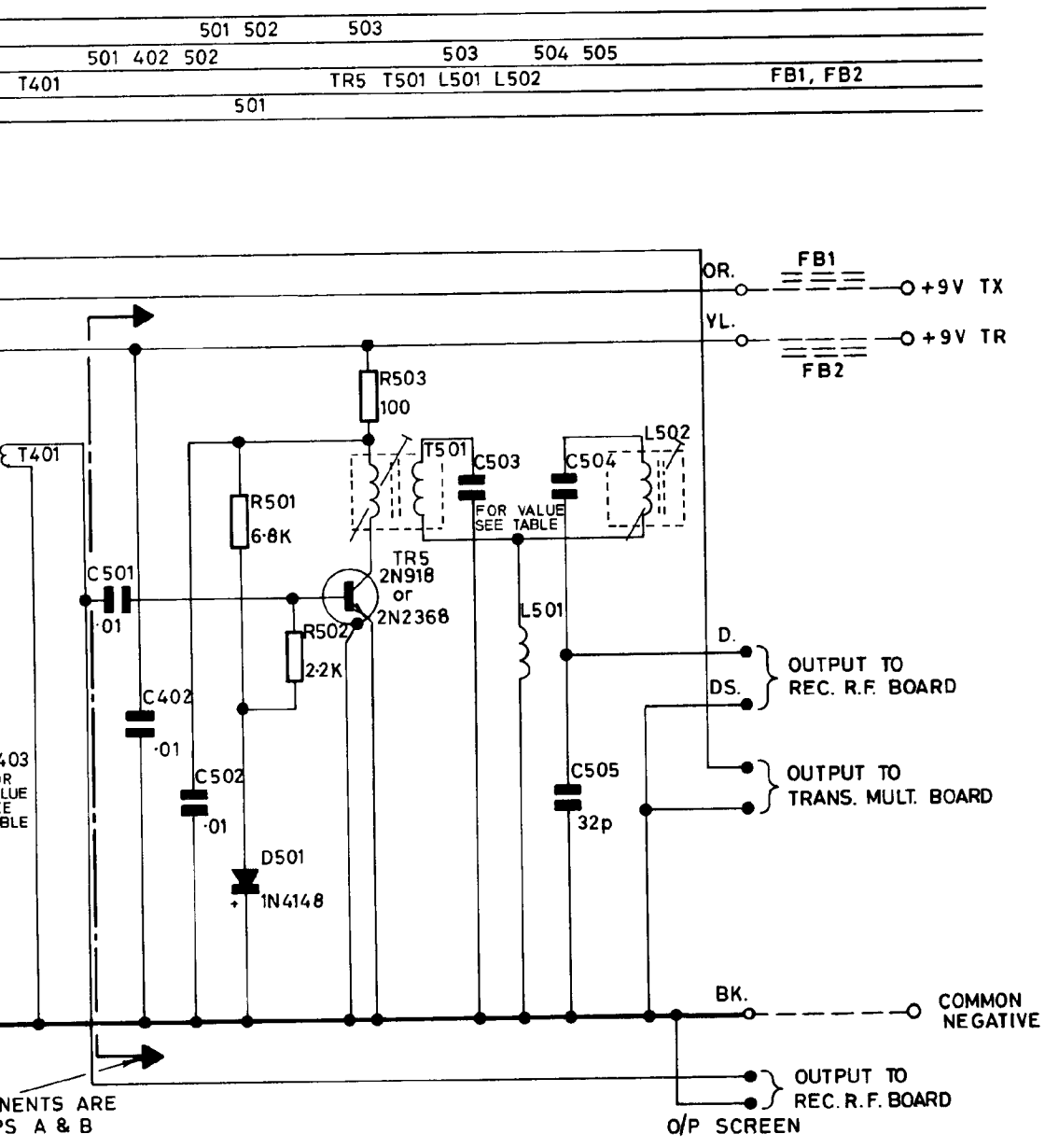
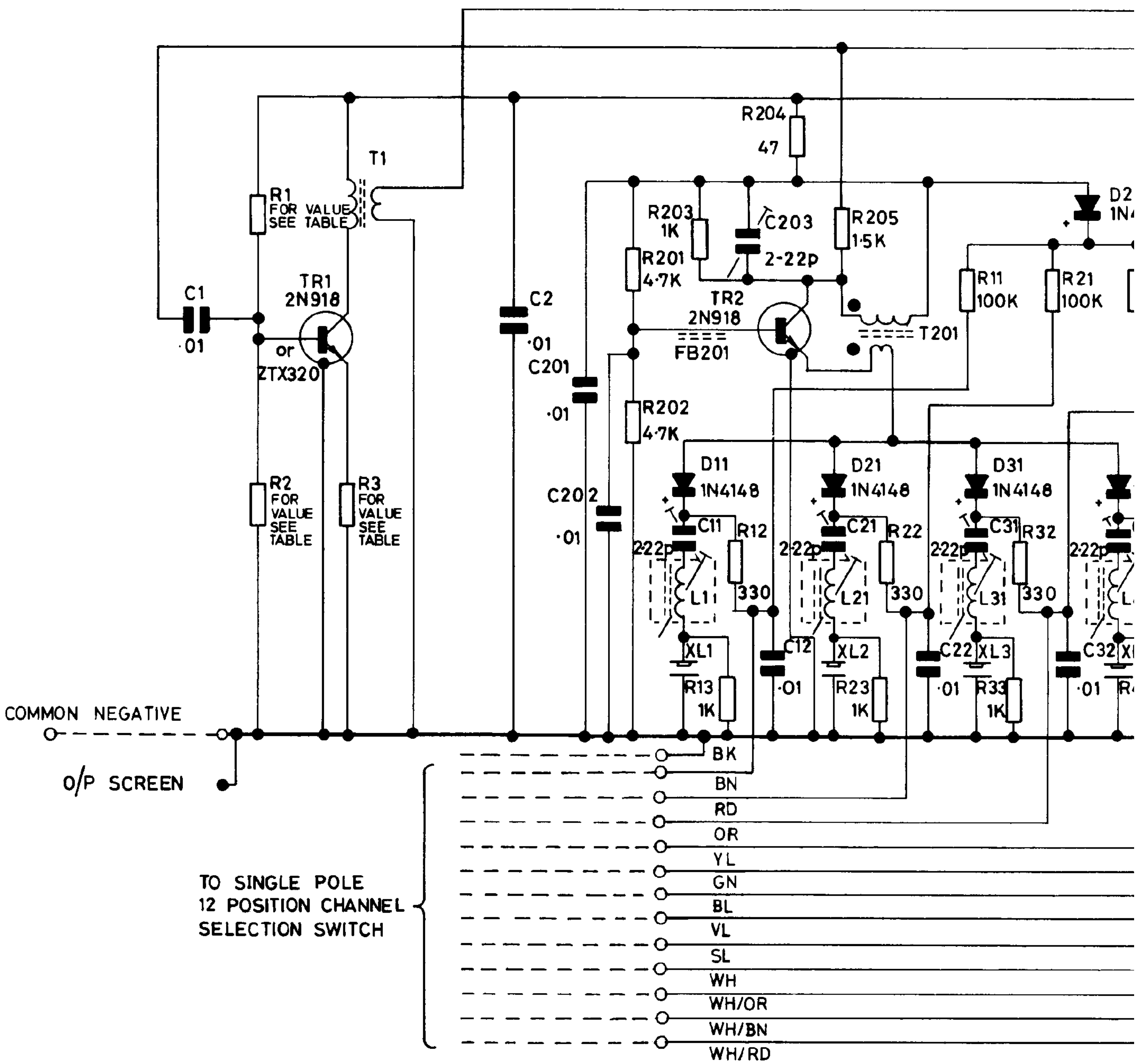


FIG. 10

SCHEM REF.	12 CHANNEL			8 CHANNEL		
	342126	342127	342128	342129	342130	342131
	GROUP A	GROUP B	GROUP C	GROUP E	GROUP F	GROUP G
R1	6·8K	10K	10K	3·3K	4·7K	4·7K
R2	2·2K	2·2K	2·2K	1K	1K	1K
R3	270	150	100	270	150	100

RESISTORS
CAPACITORS
MISCELLANE

RESISTORS	1 2 3 201 202 203 12 13 204 205 22 23 11 32 33 21 31 4
CAPACITORS	1 2 201 202 11 203 12 21 22 31 32 41
MISCELLANEOUS	TR1 T1 TR2 FB201 L1 XL1 L21 XL2 T201 L31 XL
	D11 D21 D31 D201



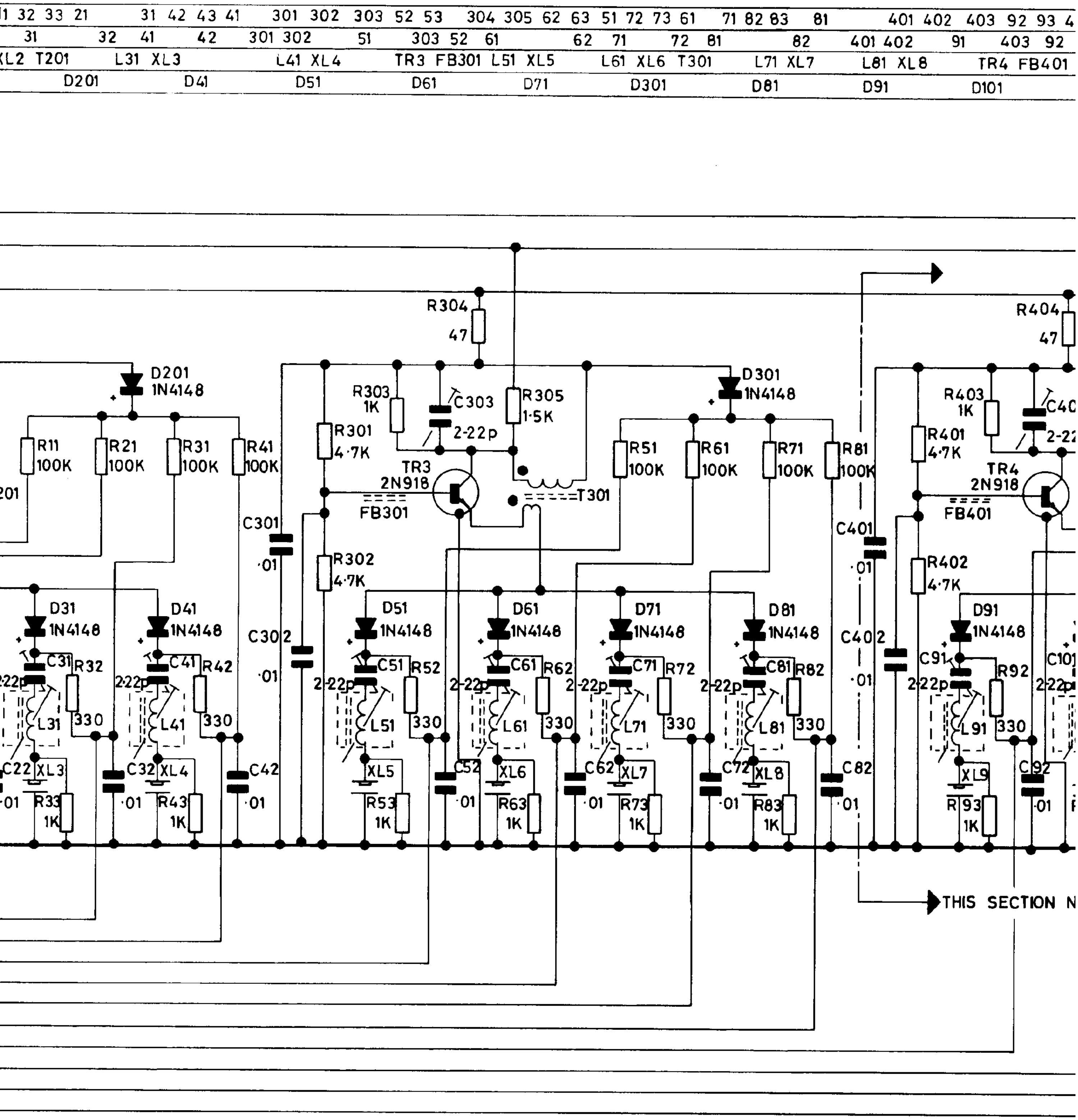


FIG 11

342126/31

OSCILLATOR BOARD. 8 & 12 CH.

16-LMU-7

			401	402		403	92	93	404	405	102	103	91	112	113	101	111	122	123	121			
		401	402		91		403	92	101		102	111			112		121		122				
	L81	XL8			TR4	FB401		L91	XL9			L101	XL10		T401			L111	XL11			L121	XL12
	D91				D101				D111				D401				D121		FB1				

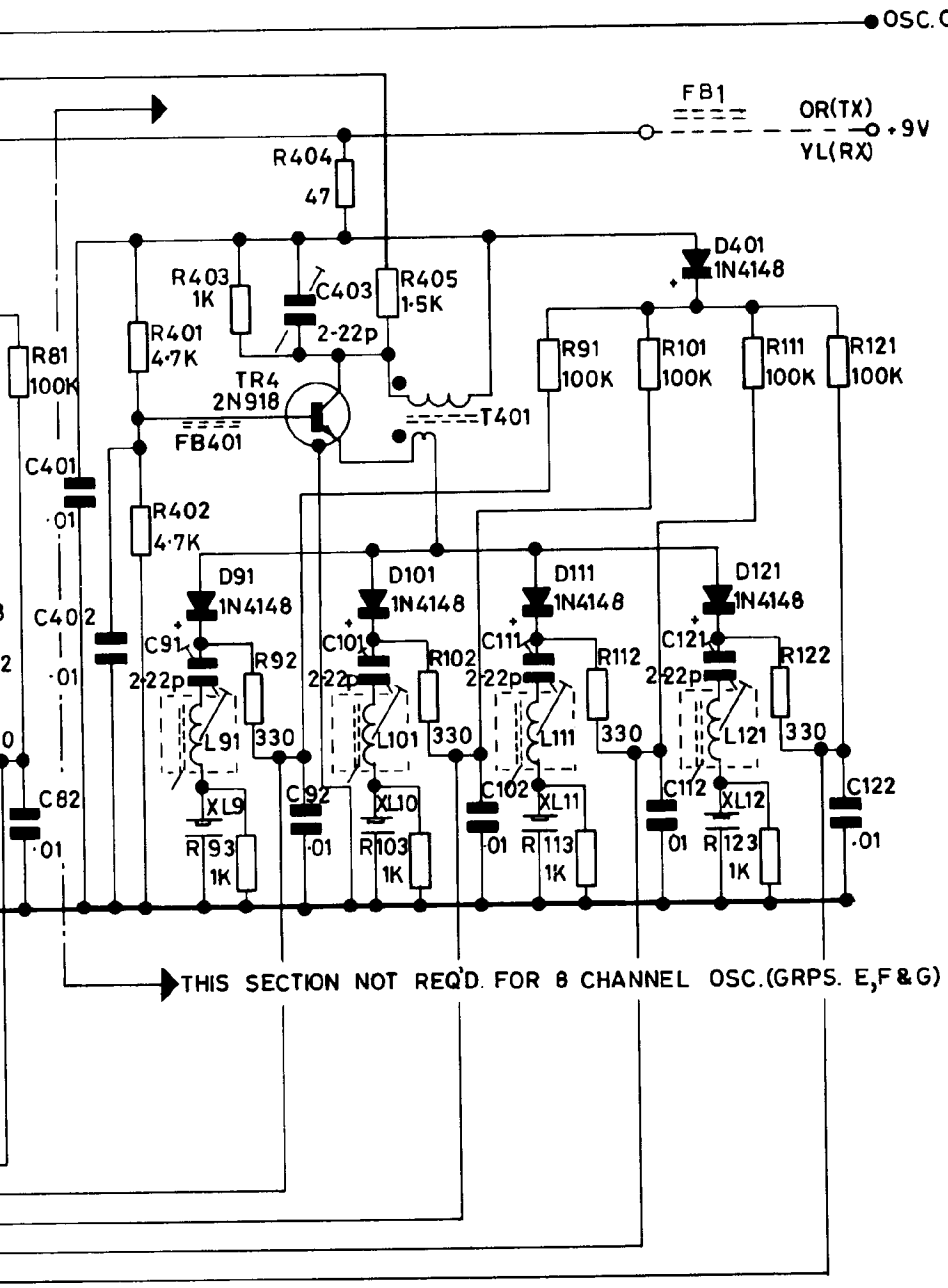
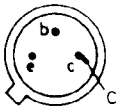


FIG 11

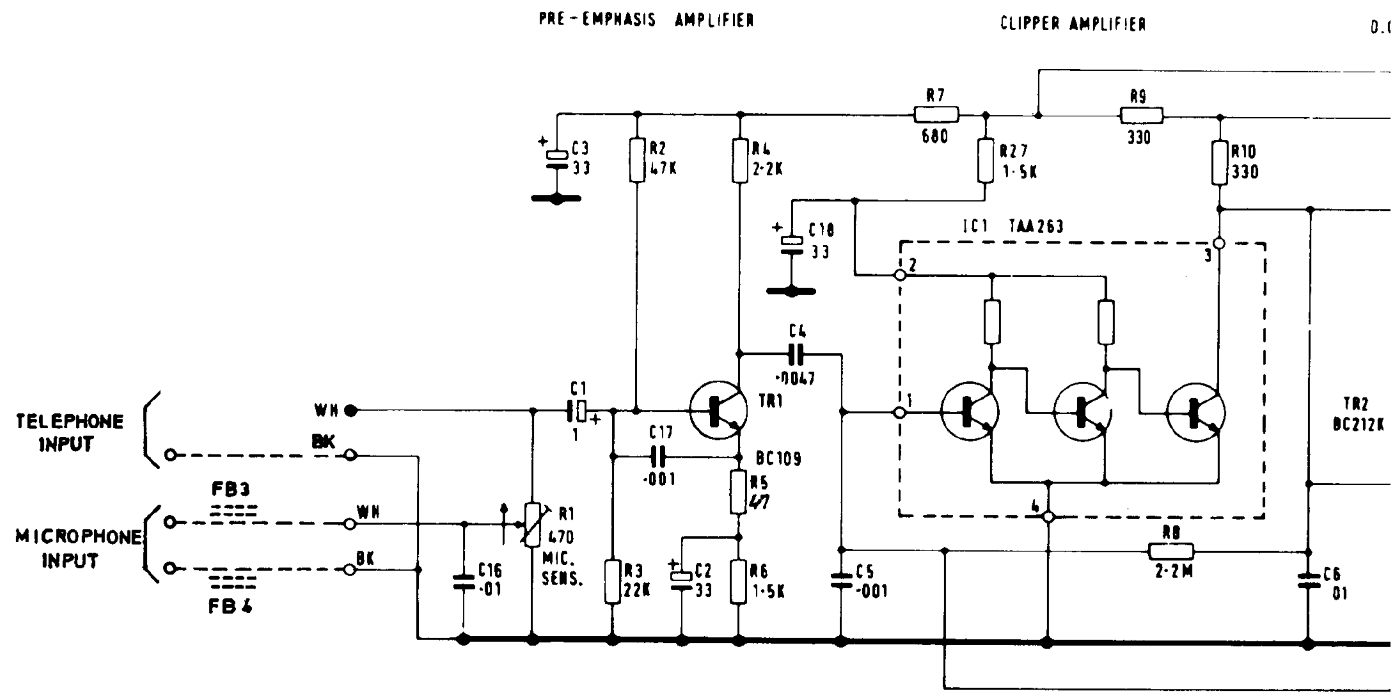


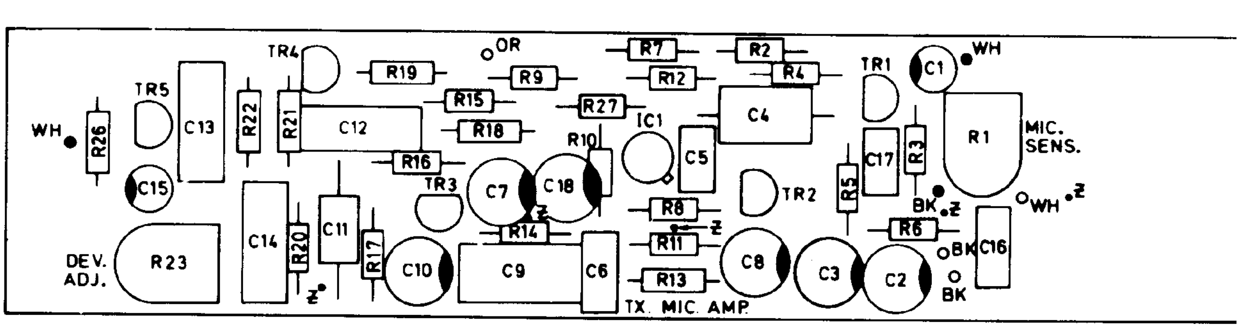
BC109

TAA263

BC173
BC212K

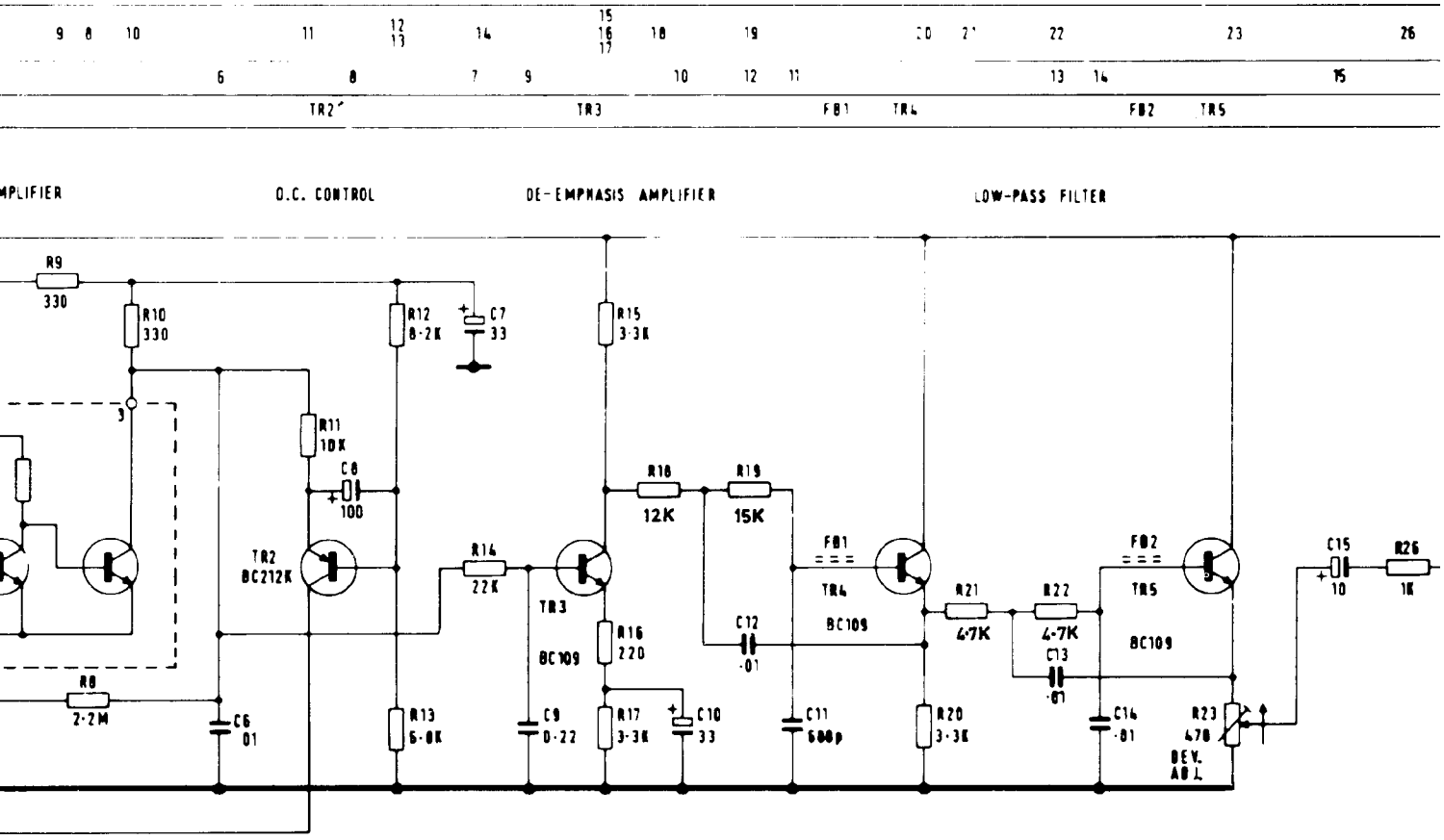
RESISTORS			1	3 2	4 5 6		7 27		9 8	10		
CAPACITORS		16	3 1	17 2		4 18 5					6	
MISCELLANEOUS	FB3 FB4				TR1			IC1				

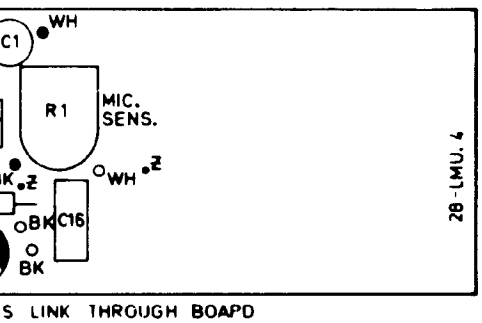




FB1 FITTED ON BASE LEAD OF TR4
FB2 " " " " " TR5

Z INDICATES LINK THROUGH BOAPD





S LINK THROUGH BOAPD

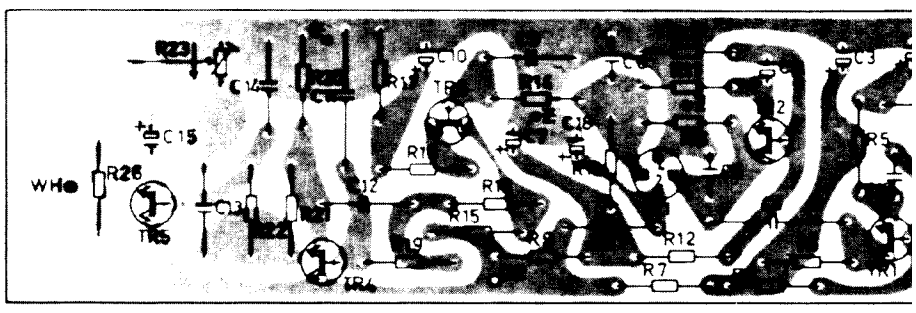
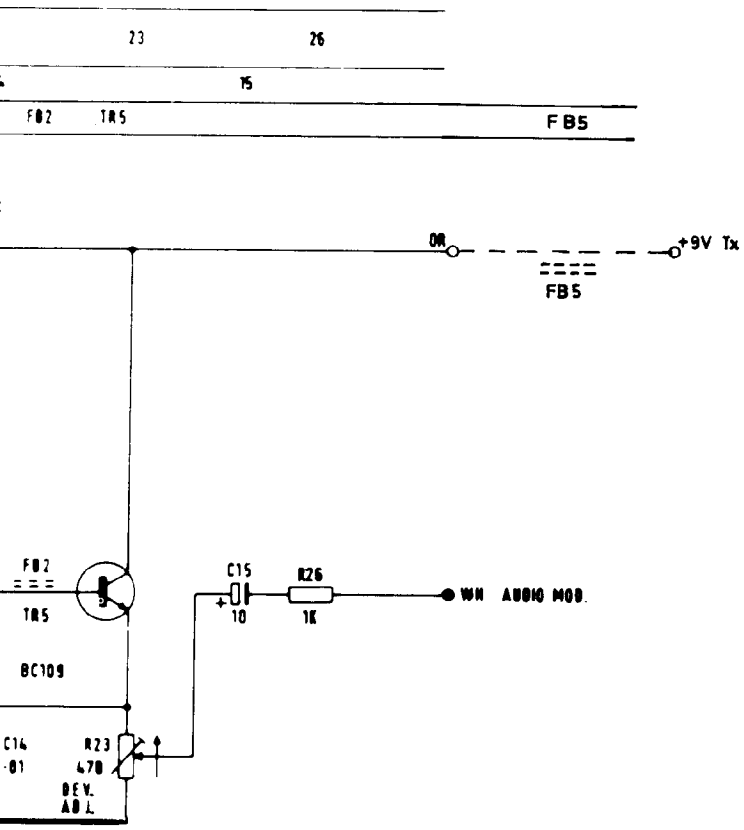
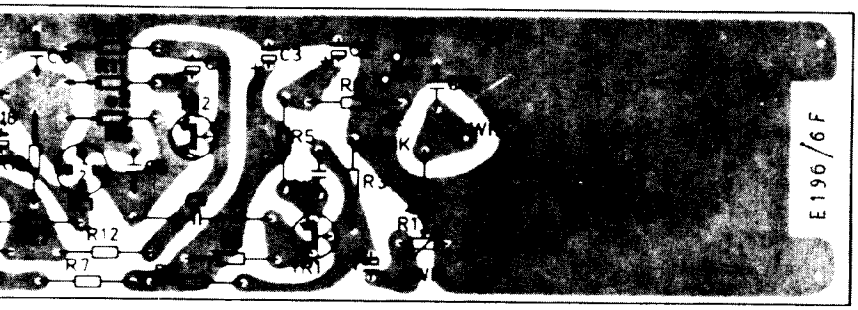


FIG.
12





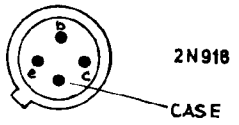
TRANSMITTER MICROPHONE AMPLIFIER BOARD

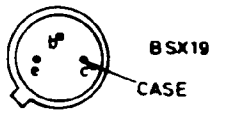
351050

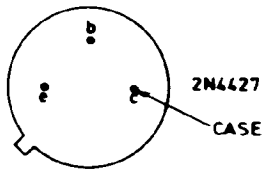
28-LMU-4A

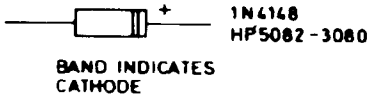
FIG.
12

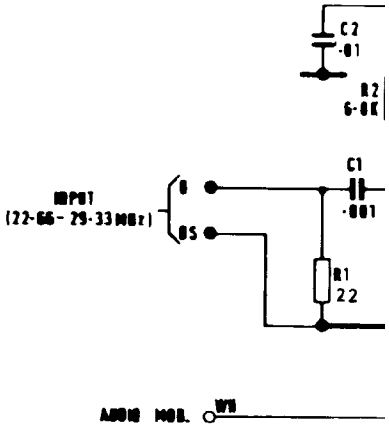
RESISTORS	1
CAPACITORS	2 1
MISCELLANEOUS	







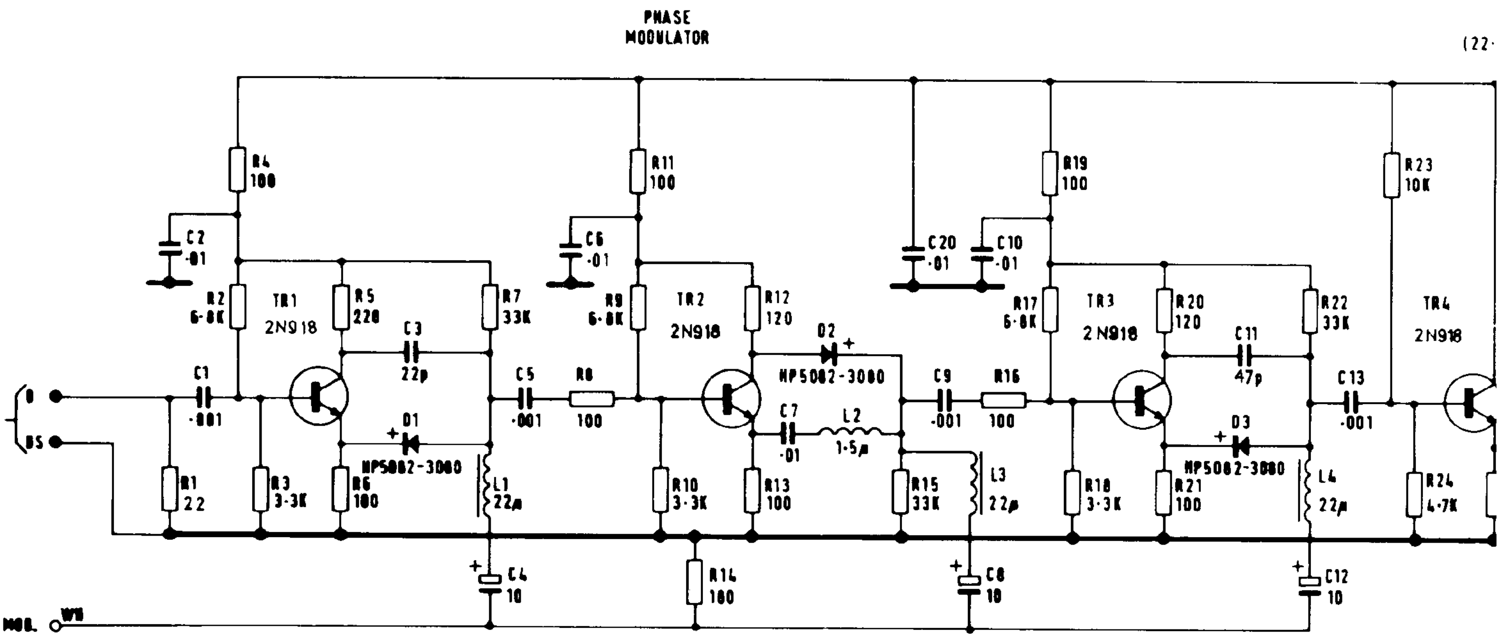


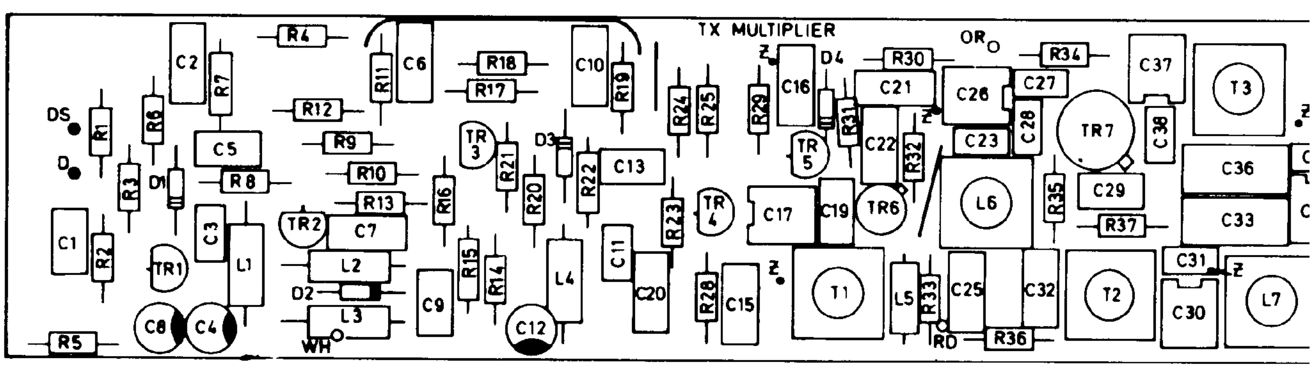


1 4 2 3 5 6 7 8 11 9 10 14 12 13 15 16 19 17 18 20 21 22 23 24 2

2 1 3 4 5 6 7 20 9 10 8 11 12 13

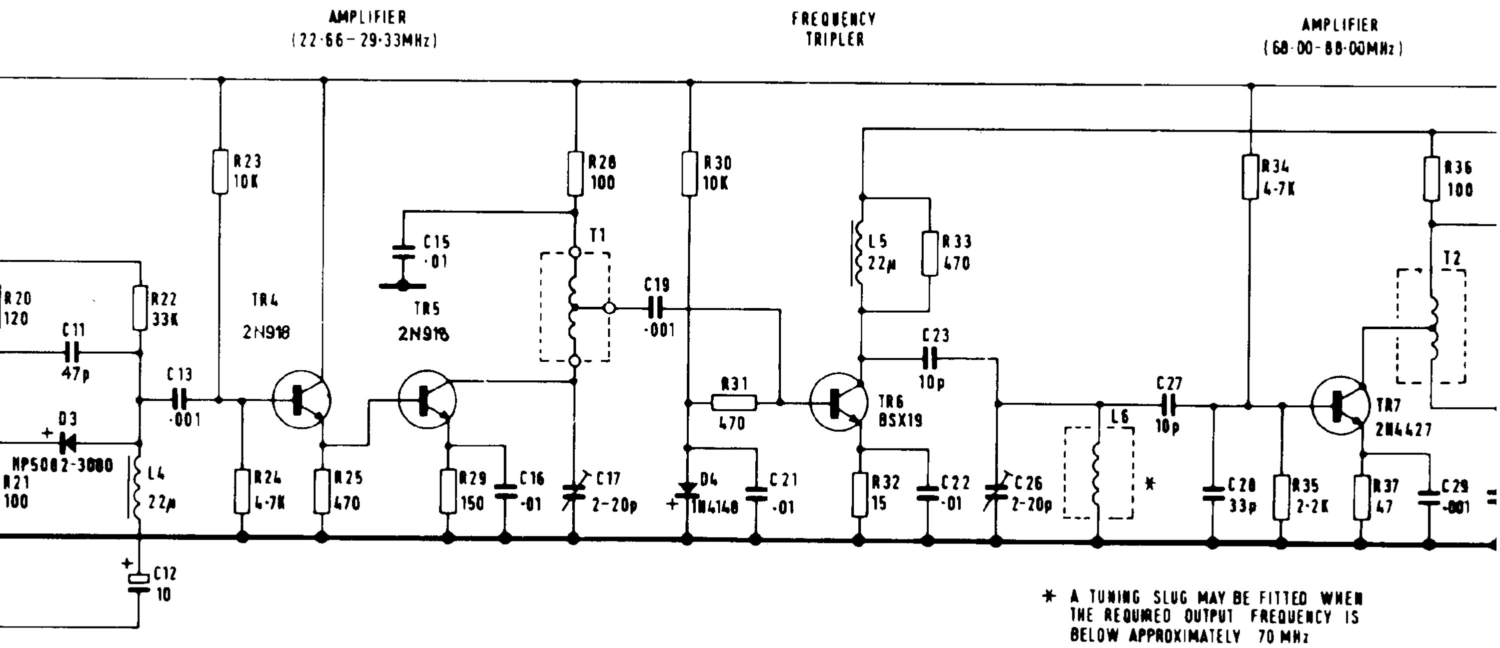
TR1 D1 L1 TR2 D2 L2 L3 TR3 D3 L4 TR4

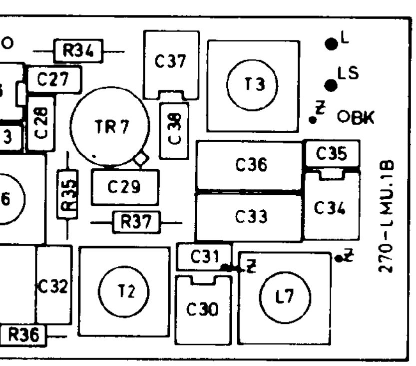


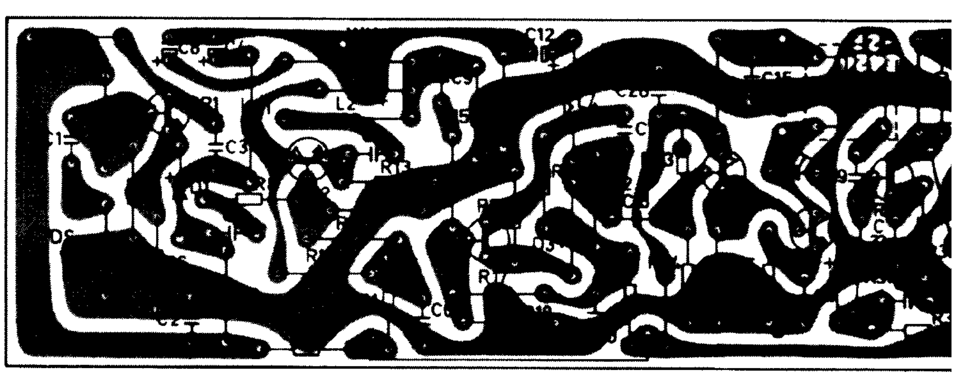


Z INDICATES LINK THROUGH BOARD
A HEAT-SINK IS FITTED TO TR6

22	23	24	25	29	28	30	31	32	33	34	35	37	36		
11	12	13	15	16	17	19	21	23 22	26	27	28	29			
D3	L4	TR4	TR5	T1	D4	TR6	L5	L6	TR7	T2					







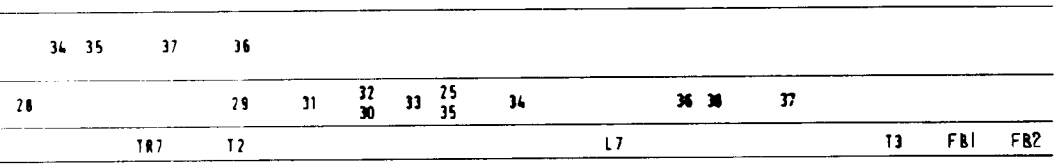
THROUGH BOARD
FITTED TO TR6

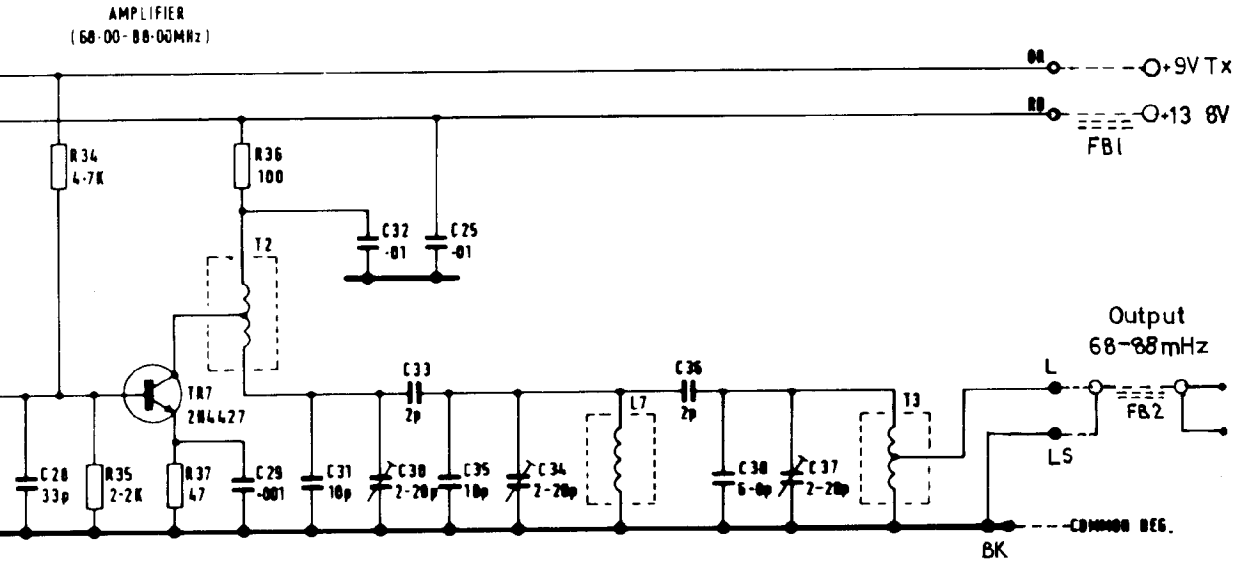
FIG. 13

351602

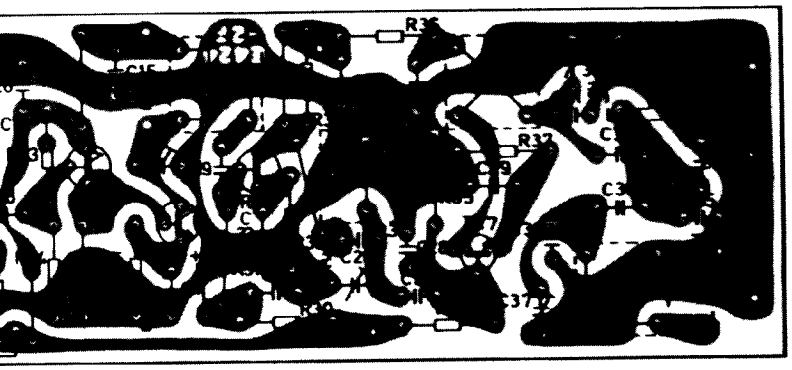
TRANSMITTER MULTIPLIER BOARD

LOW BAND





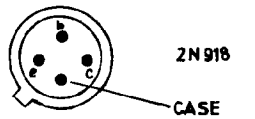
MAY BE FITTED WHEN
OUTPUT FREQUENCY IS
IMATELY 70 MHz

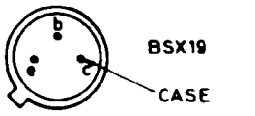


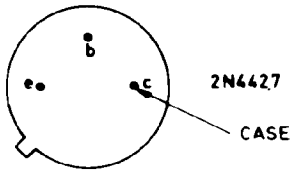
270-LMU-1B

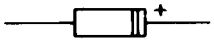
FIG. 13

RESISTORS		21	29 26	25	27 28			38
CAPACITORS		40	36				41	2
MISCELLANEOUS					TR6		D3	L9

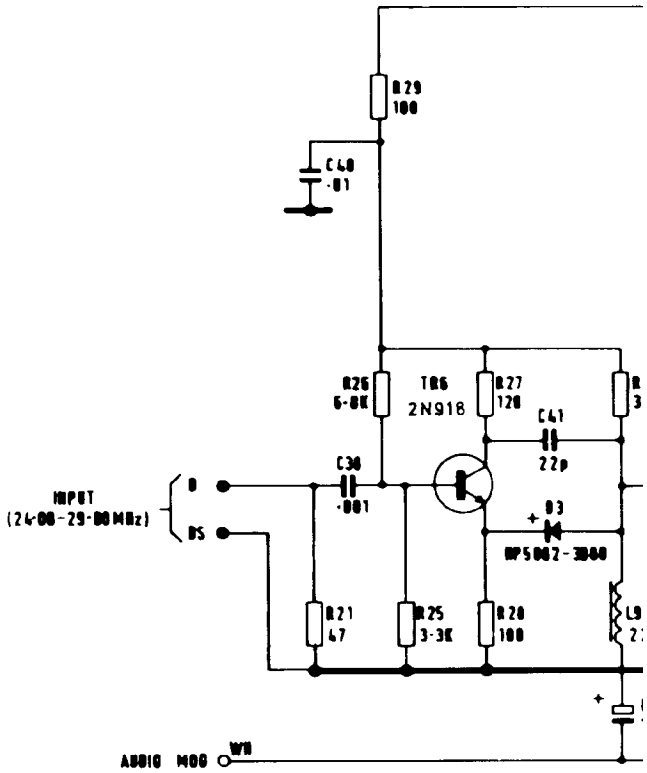


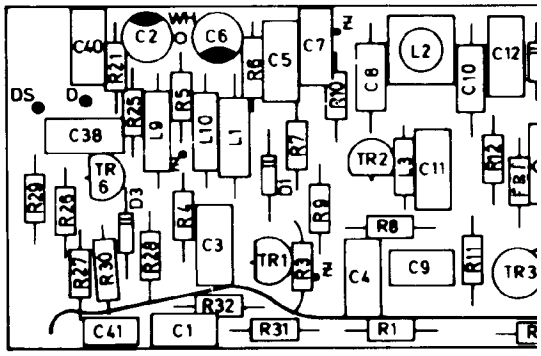




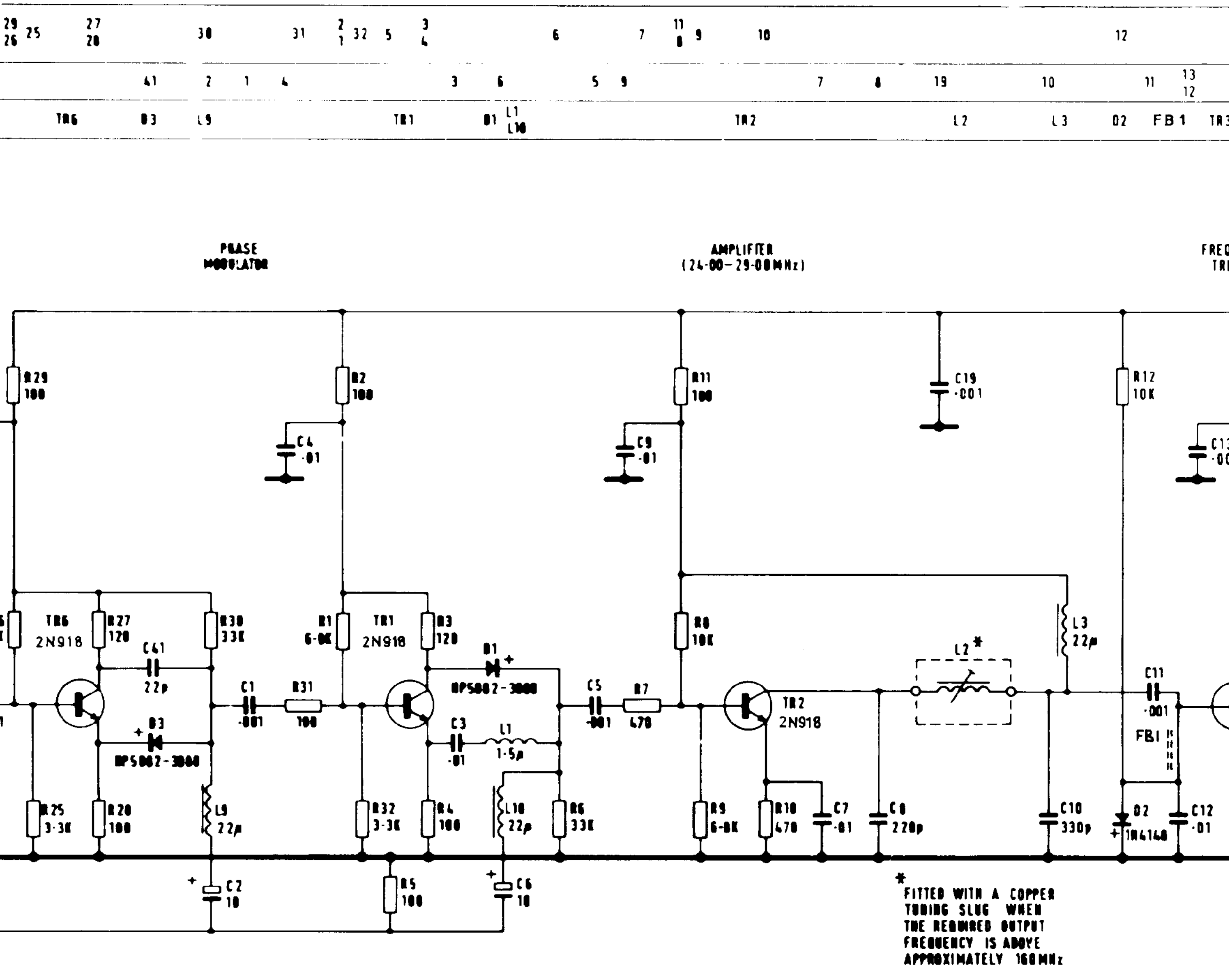


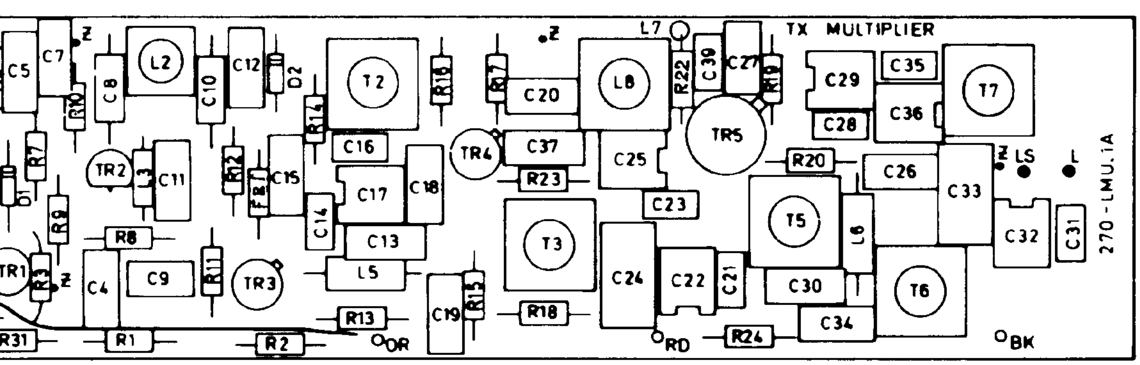
BAND INDICATES CATHODE



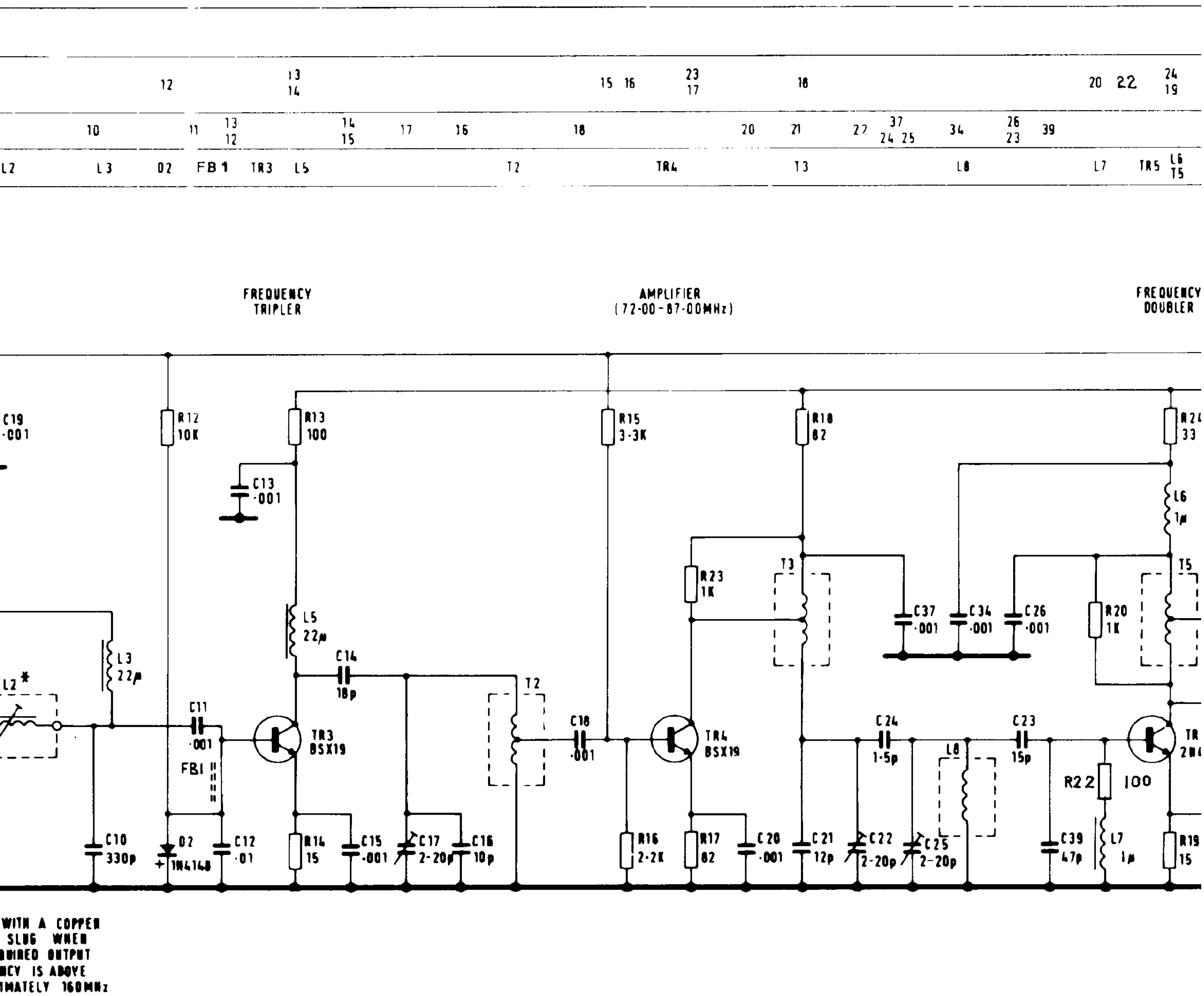


Z INDICATES LINK THROU
HEAT SINKS ARE FITTED





Z INDICATES LINK THROUGH BOARD
HEAT SINKS ARE FITTED TO TR3 & TR4



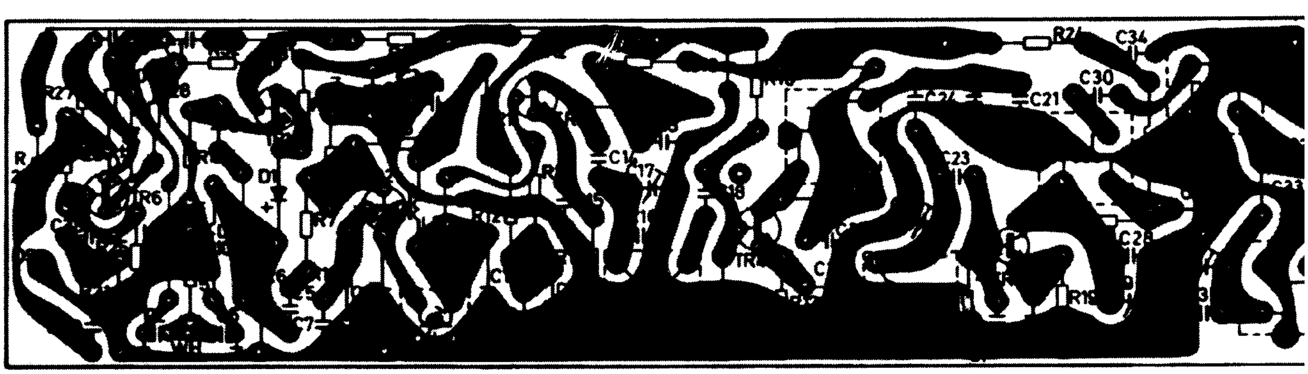
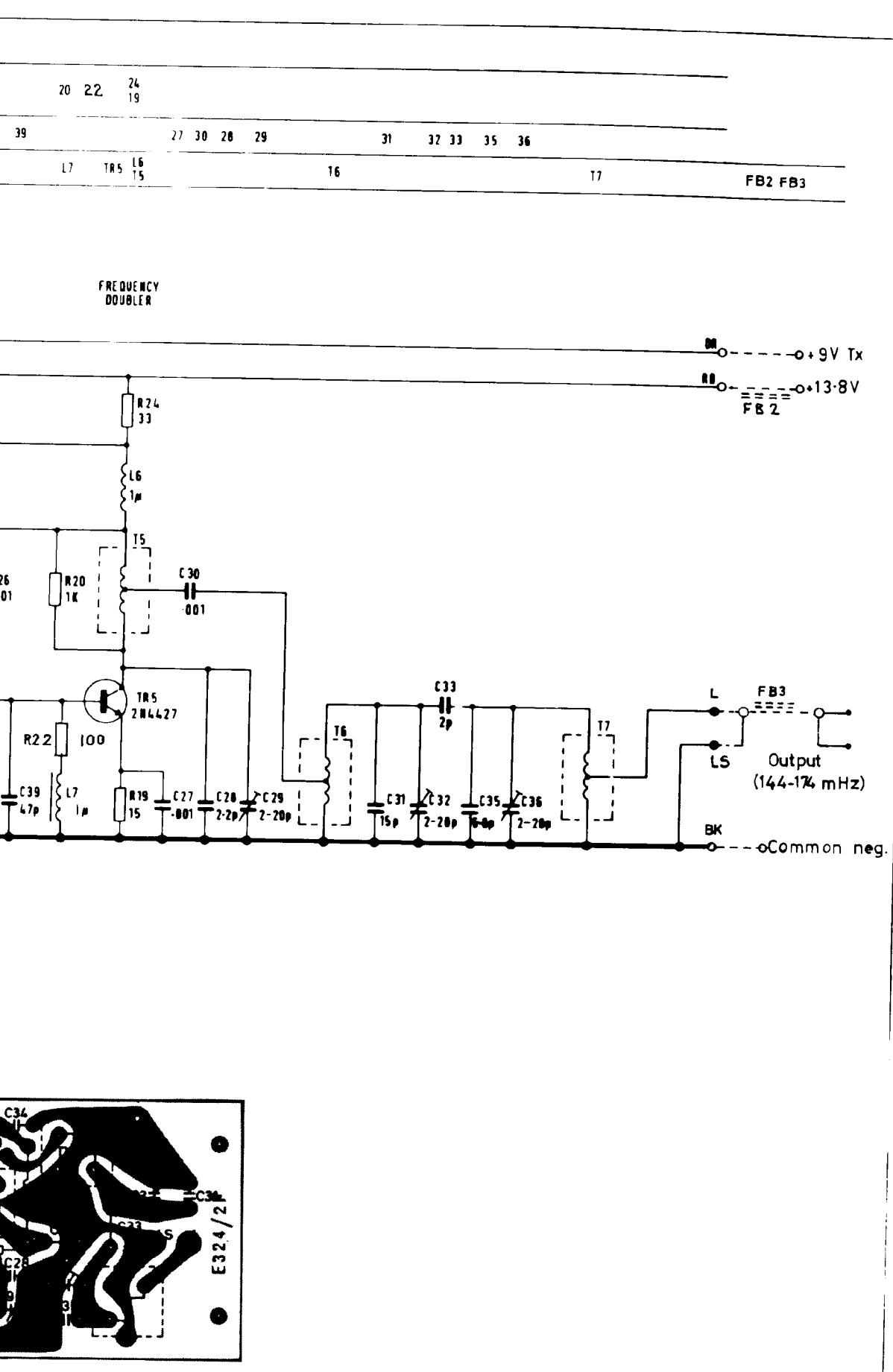


FIG. 14

TRANSMITTER MULTIPLIER BOARD

HIGH BAND

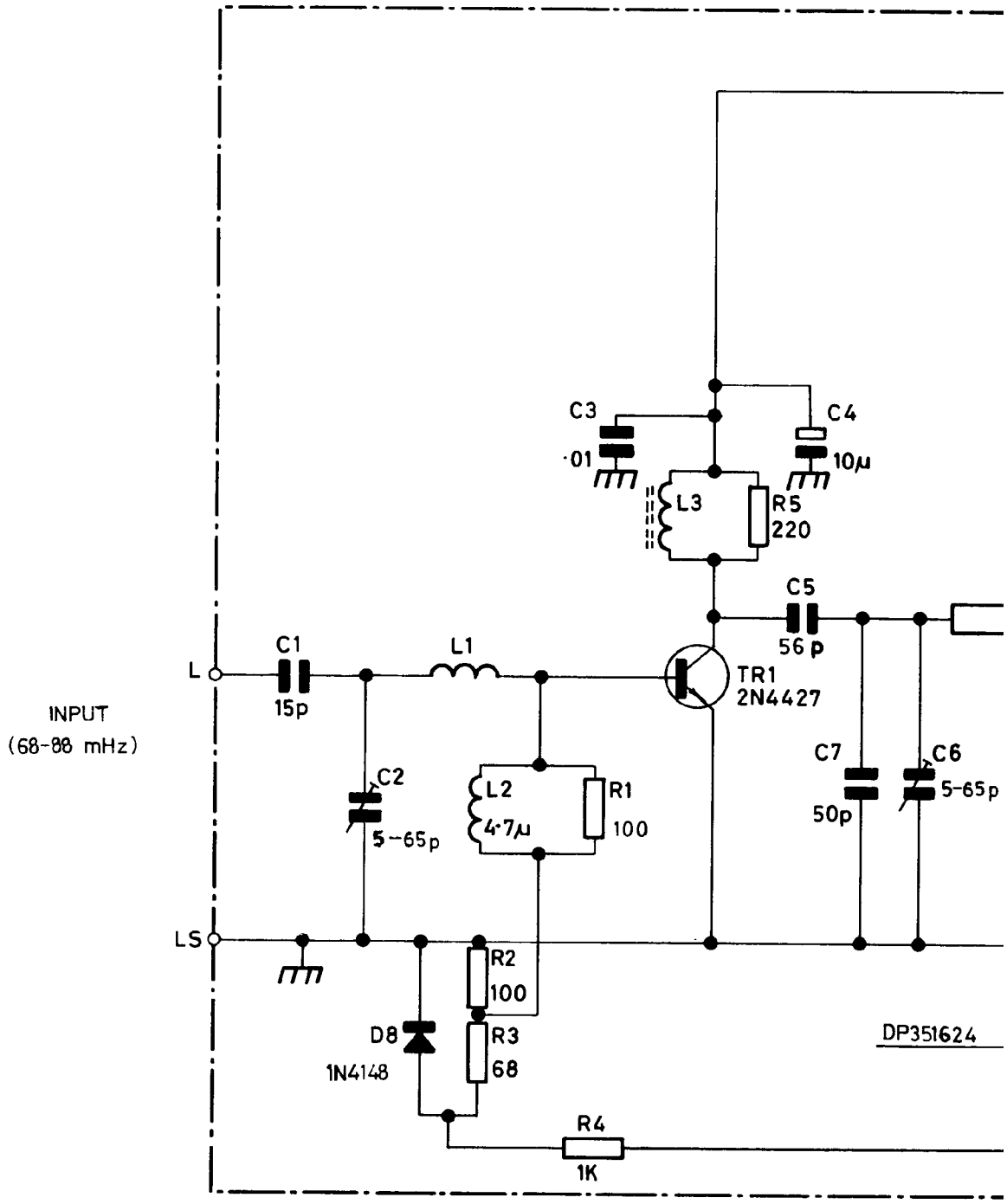
351040



270-LMU4A

FIG. 14

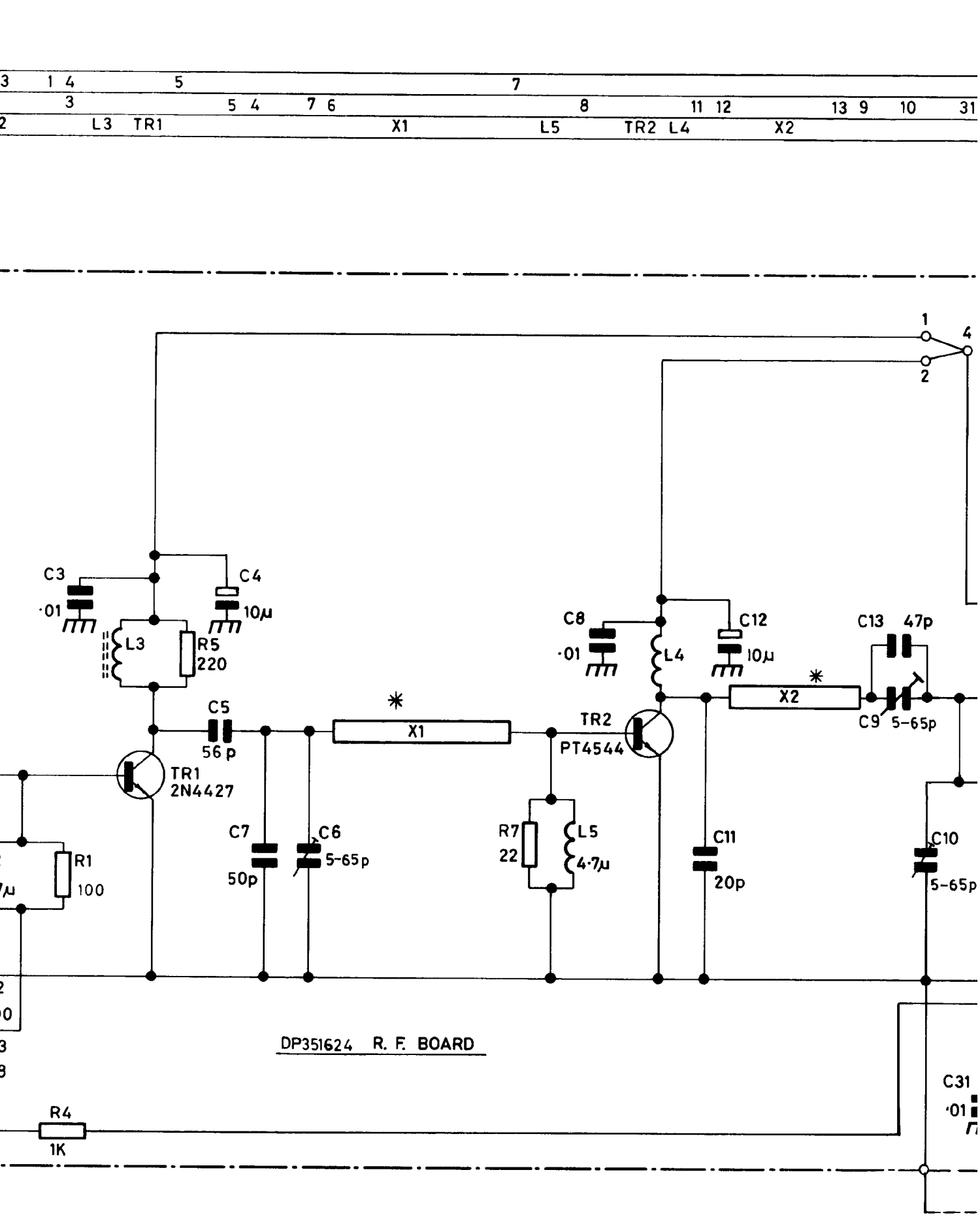
RESISTORS	2 3 1 4 5
CAPACITORS	1 2 3 5 4 7 6
MISCELLANEOUS	D8 L1 L2 L3 TR1

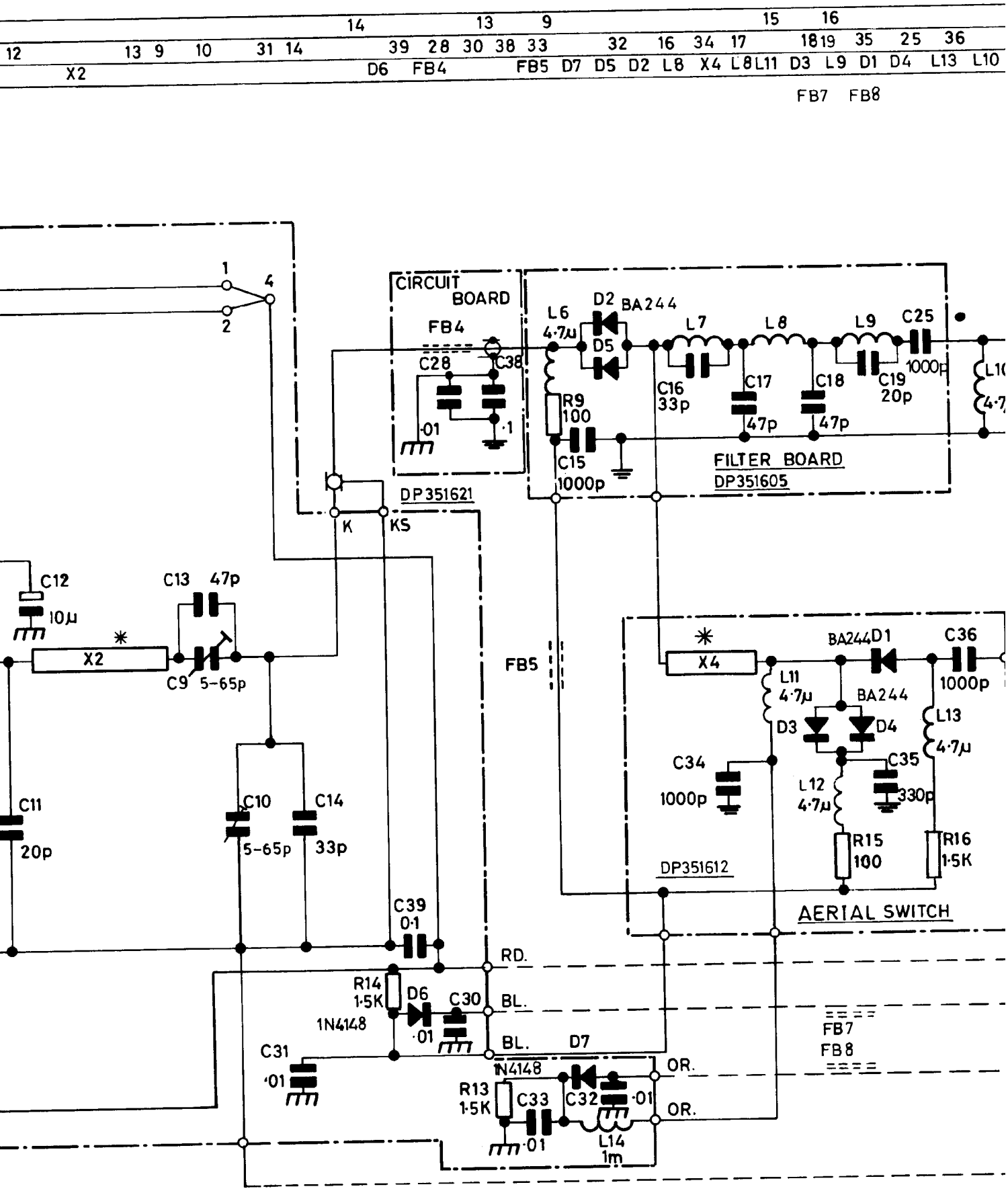


chassis earth

common negative

* printed lines





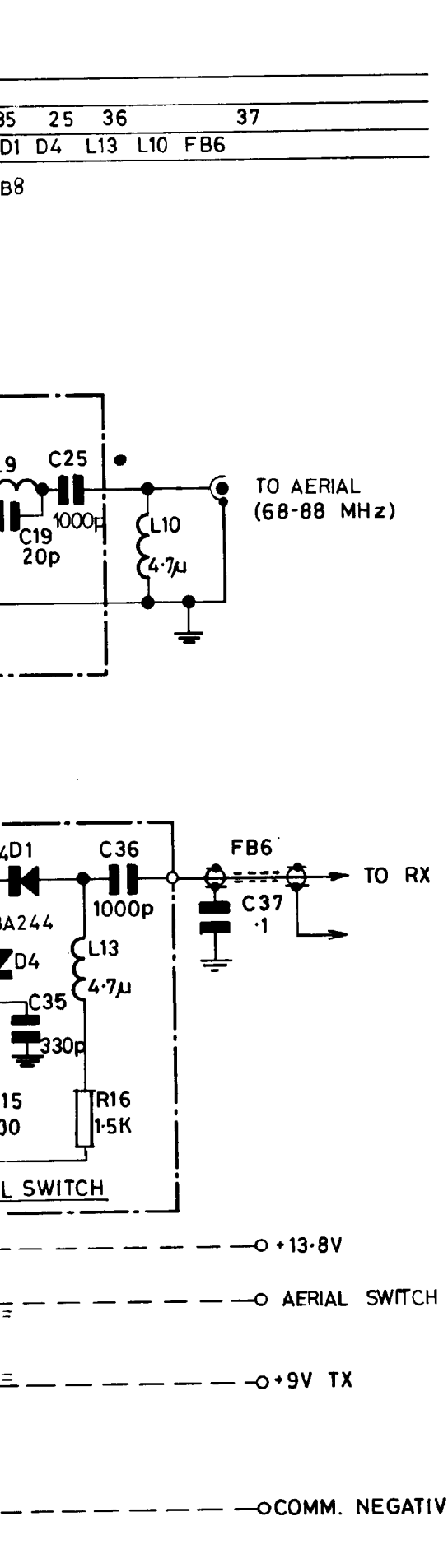


FIG. 15

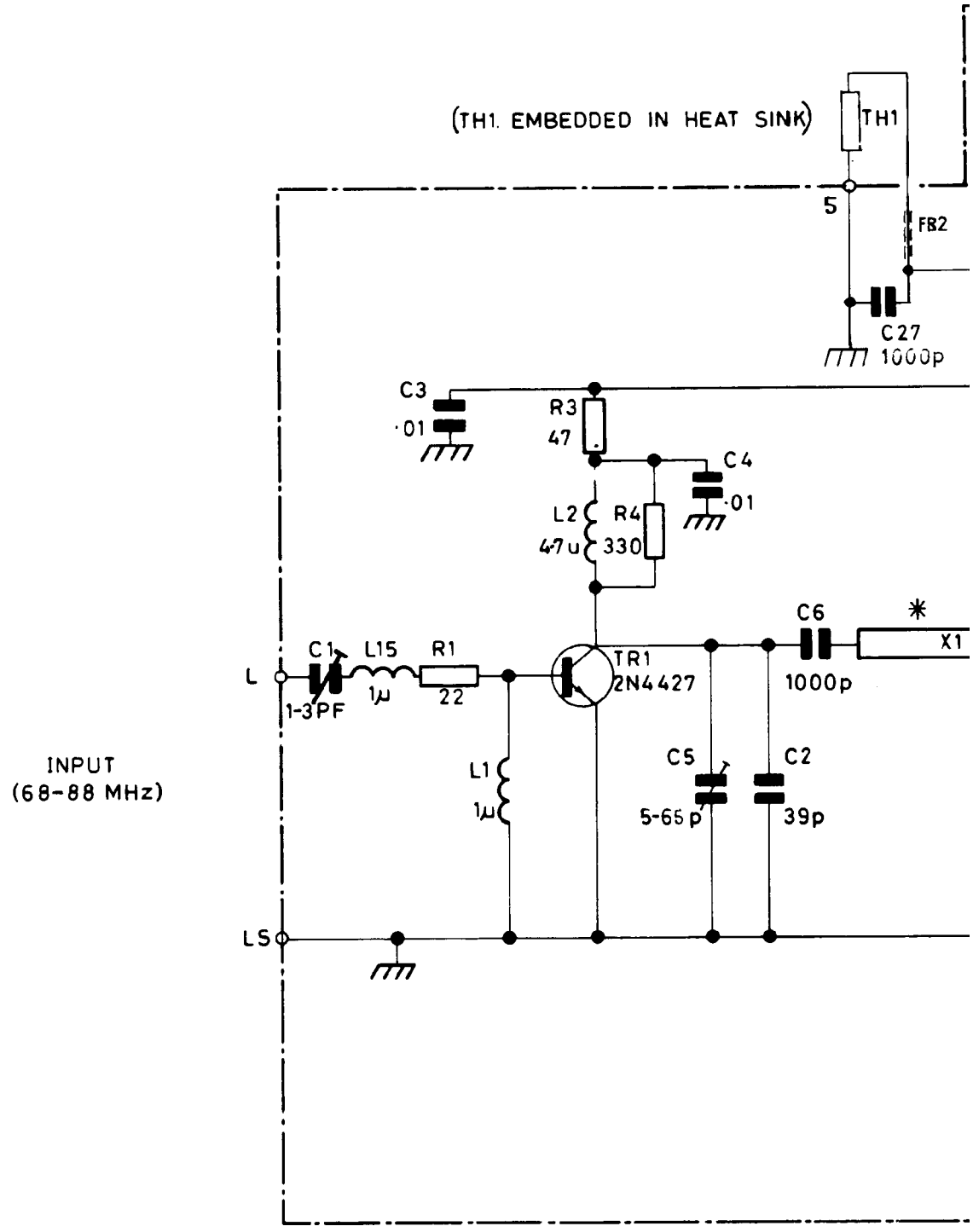
351637

28-LMU-14D

POWER AMPLIFIER (AERIAL SWITCH & FILTER) 80 MHz 10W.

FIG. 15

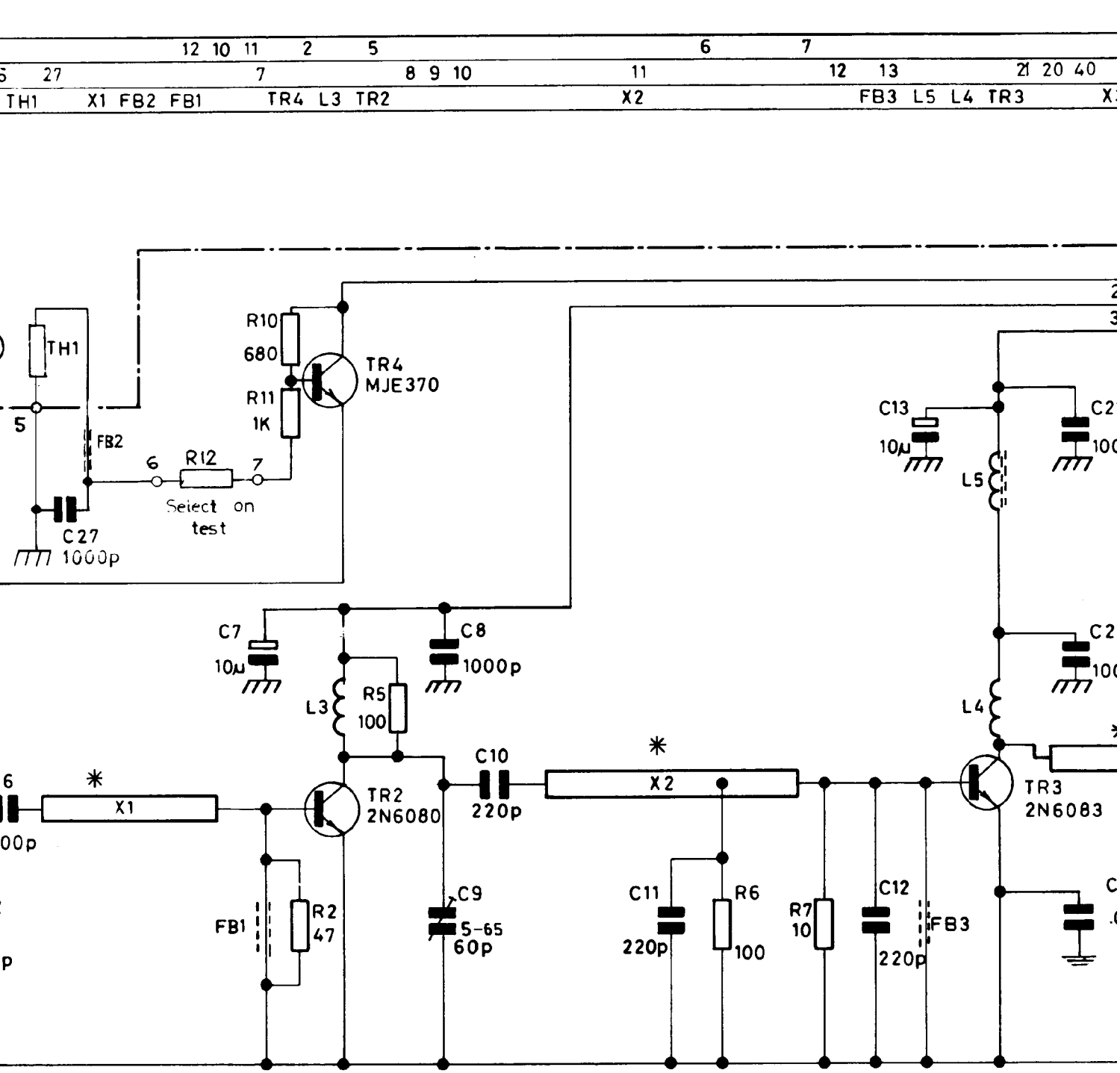
RESISTORS	1 3 4
CAPACITORS	1 3 4 5 2 6 27
MISCELLANEOUS	L15 L1 L2 TR1 TH1 X1 FB



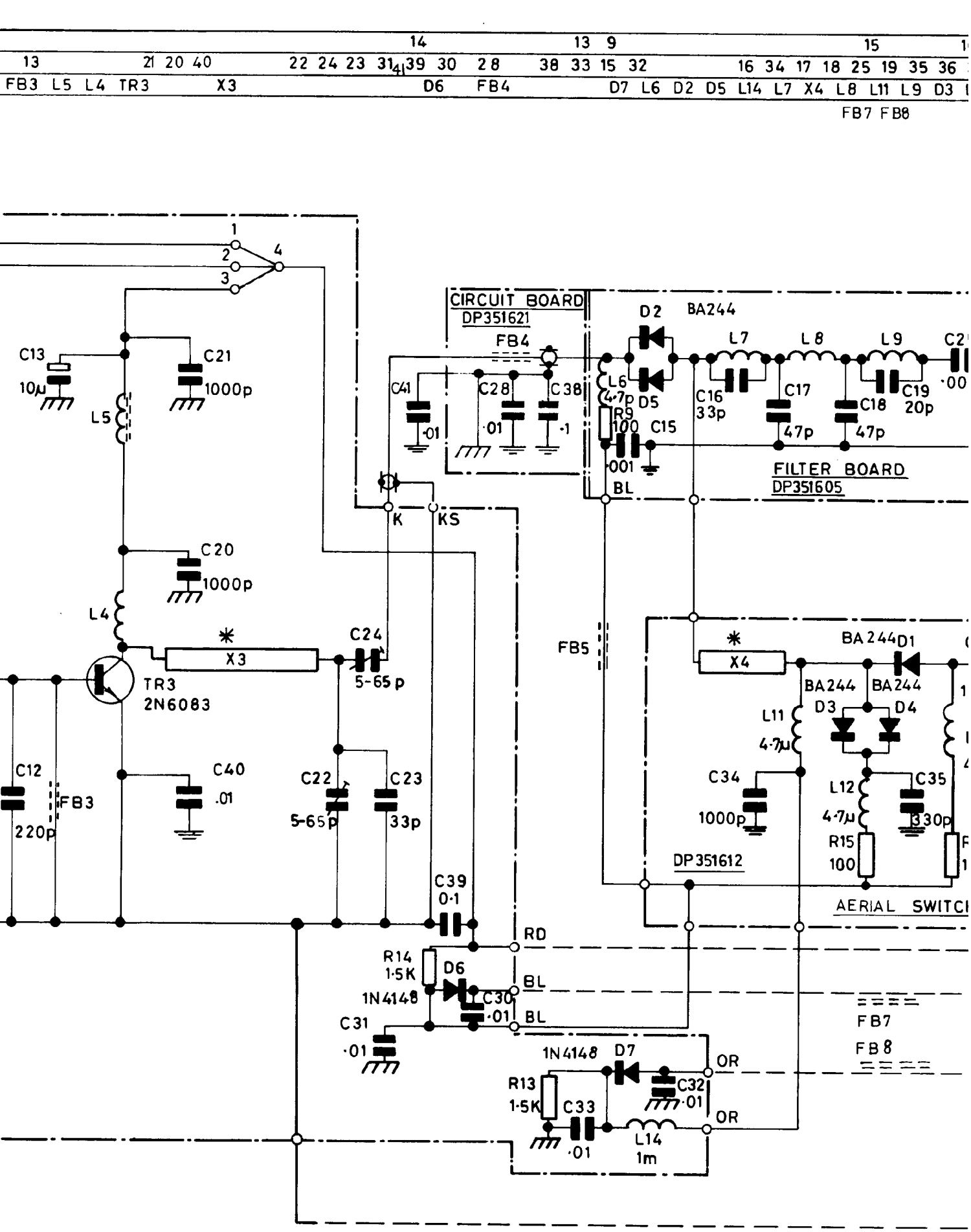
Chassis earth

Common negative

✳ Printed line



DP351616 R. F. BOARD



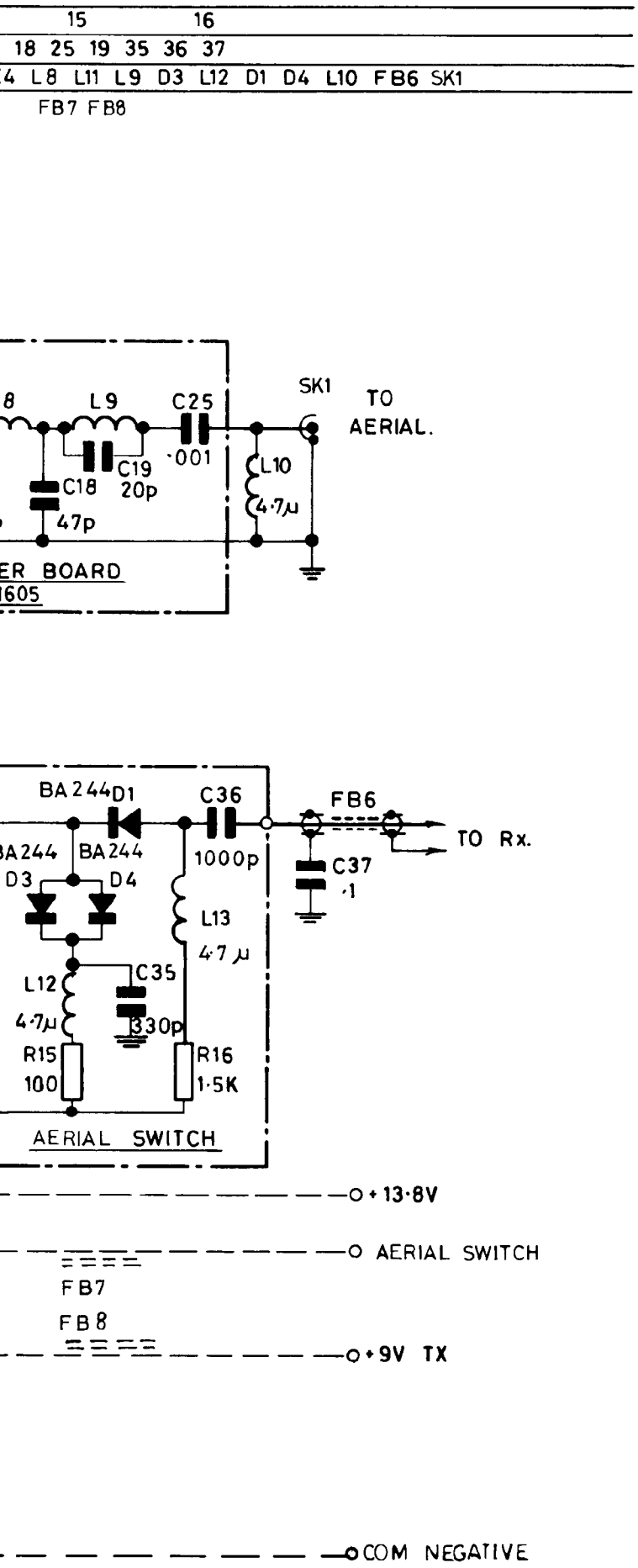
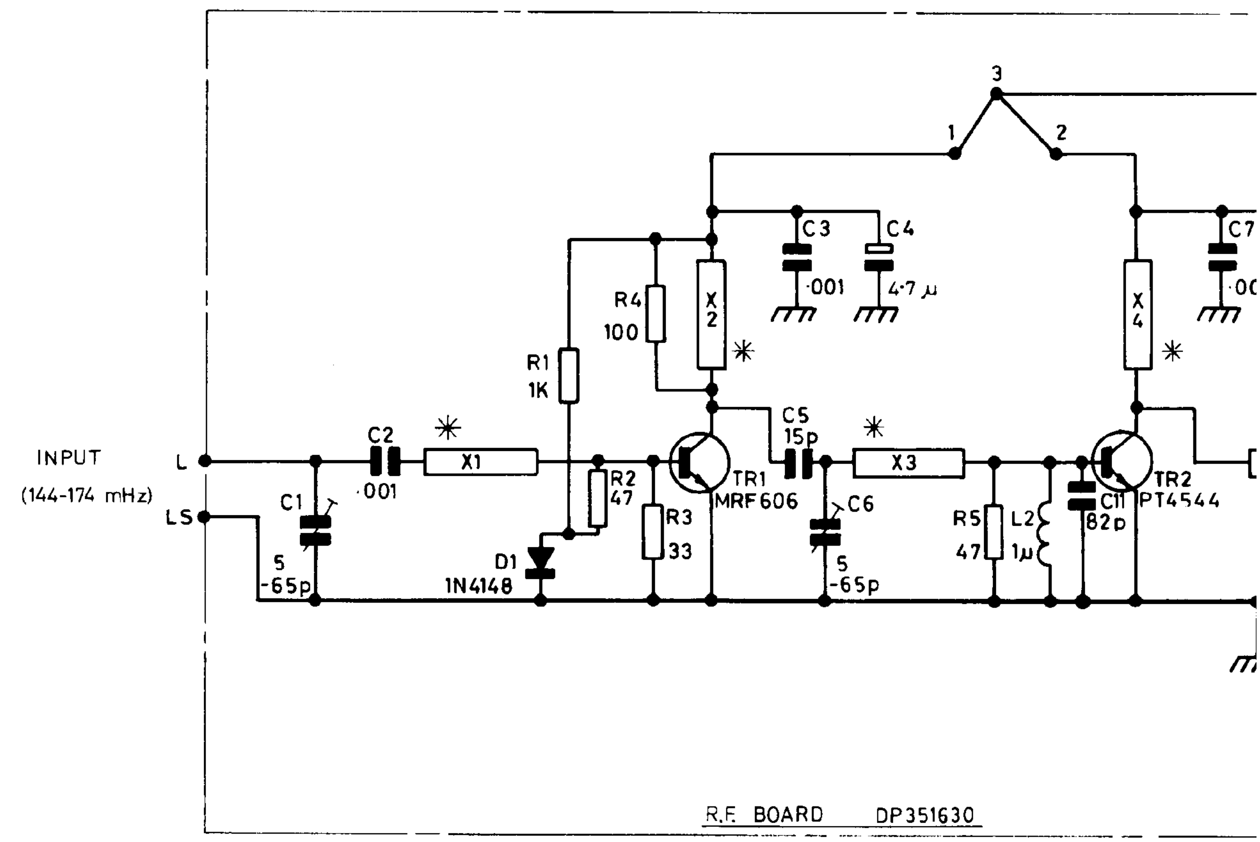


FIG. 16

28-LMU-148 POWER AMPLIFIER (AERIAL SWITCH & FILTER) 80 MHz. 25 W. 351634

FIG. 16

RESISTORS	1 2 3 4 5
CAPACITORS	1 2 3 5 6 4 11 7
MISCELLANEOUS	D1 X2 TR1 X3 L2 TR2 X4 X5



Chassis earth

Common negative

✳ Printed lines

5 12 13 14

3 5 6 4 11 7 8 10 9 20 21 22 23 29 27 28

X2 TR1 X3 L2 TR2 X4 X5 D3 L4 X8 D5 L7 L5

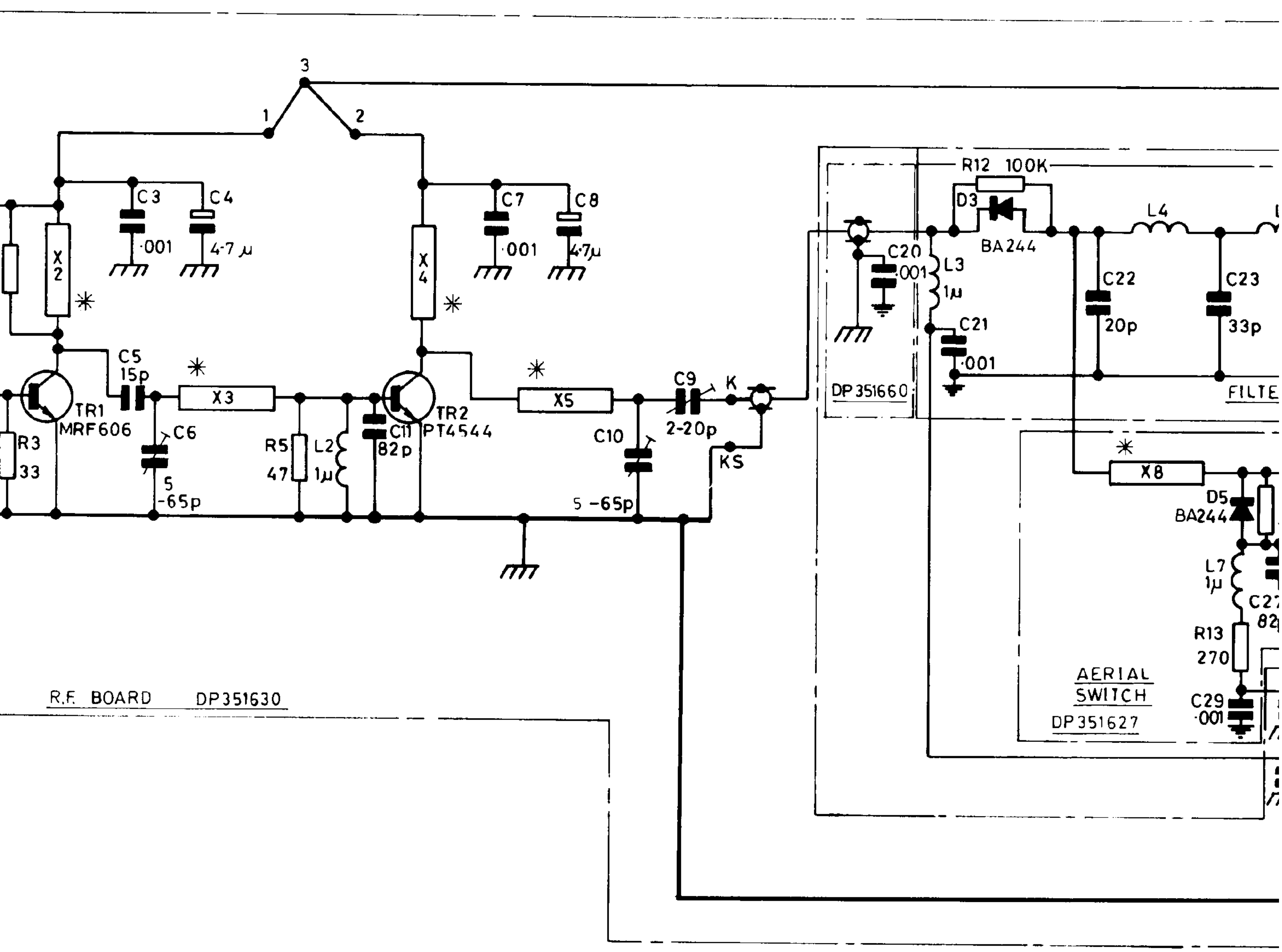


FIG 17

351629

28-LMU-14C POWER AMPLIFIER (AERIAL SWITCH & FILTER) 160MHz 10W.

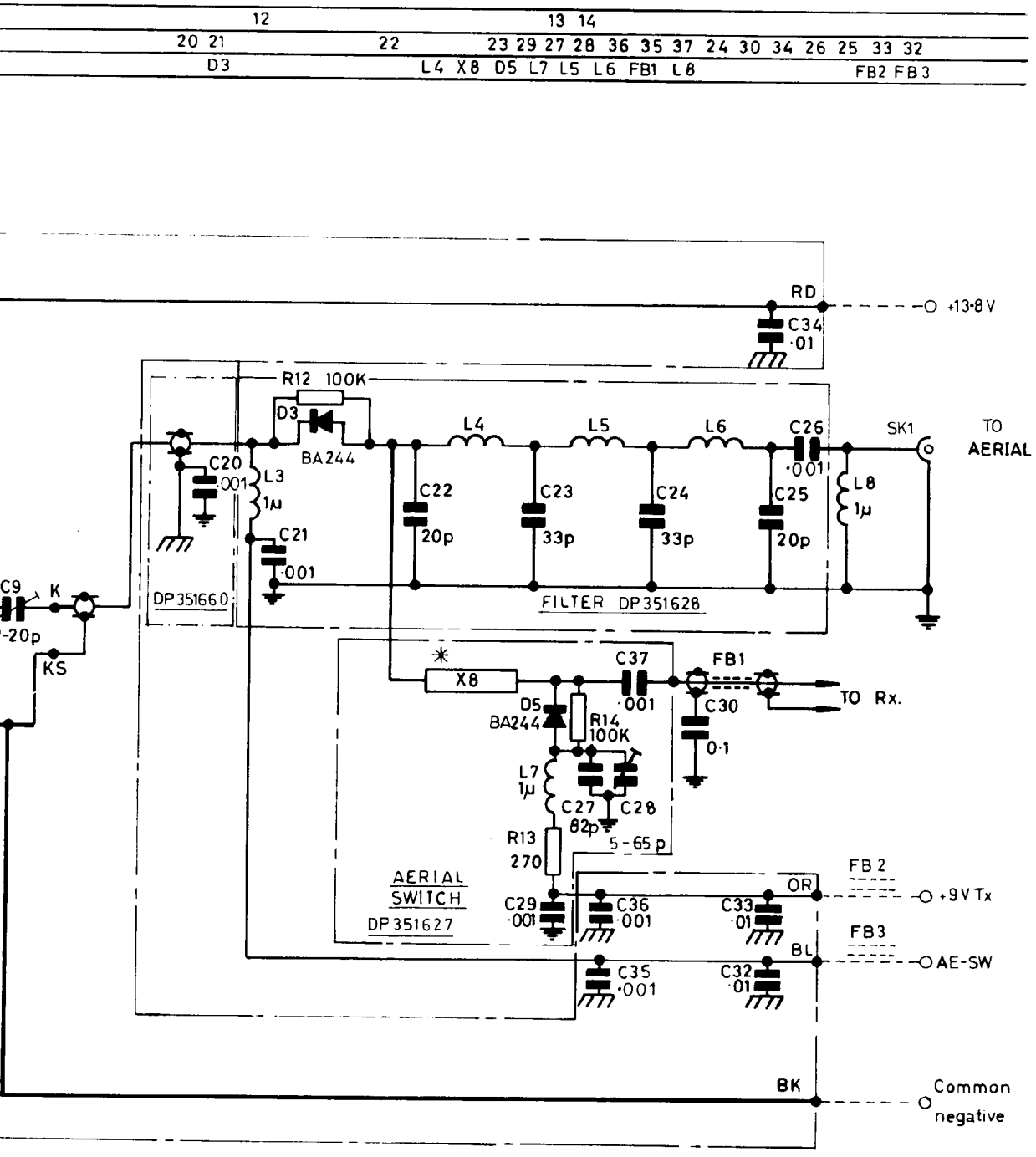
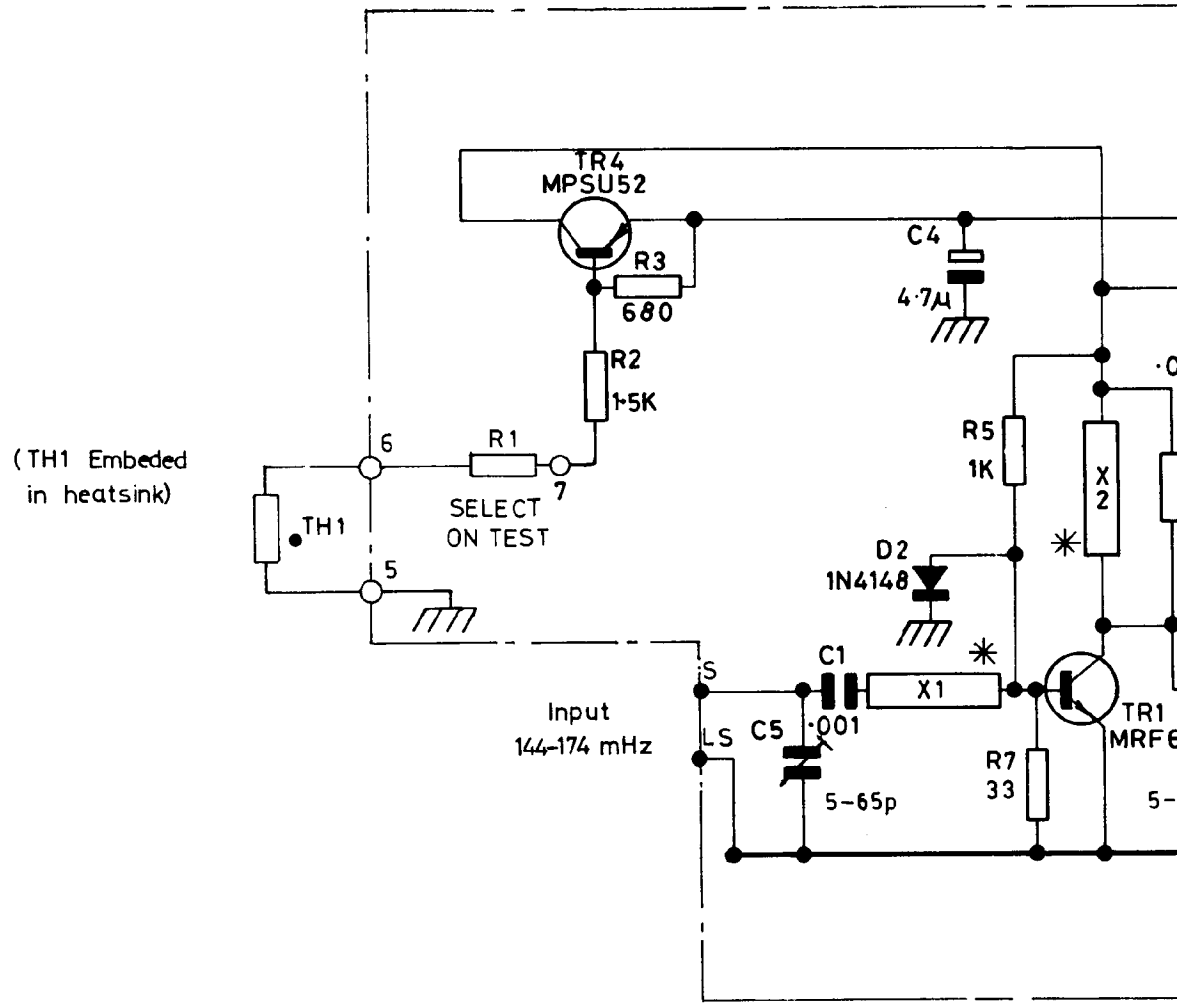


FIG 17

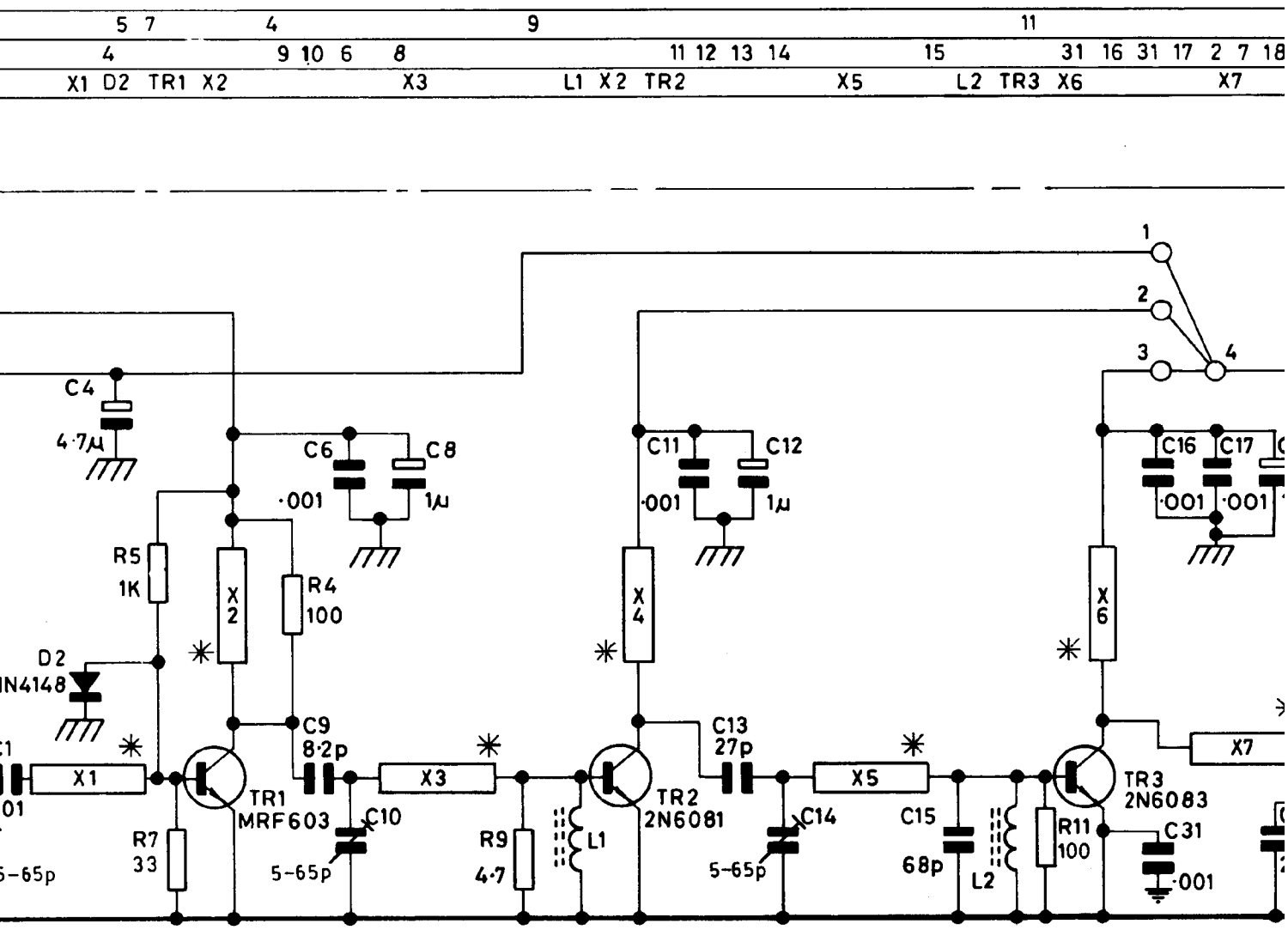
RESISTORS	3	2	1				5	7	4
CAPACITORS				5	1	4			9
MISCELLANEOUS	TR4	TH1				X1	D2	TR1	X2



Chassis earth

Common negative

✳ Printed lines

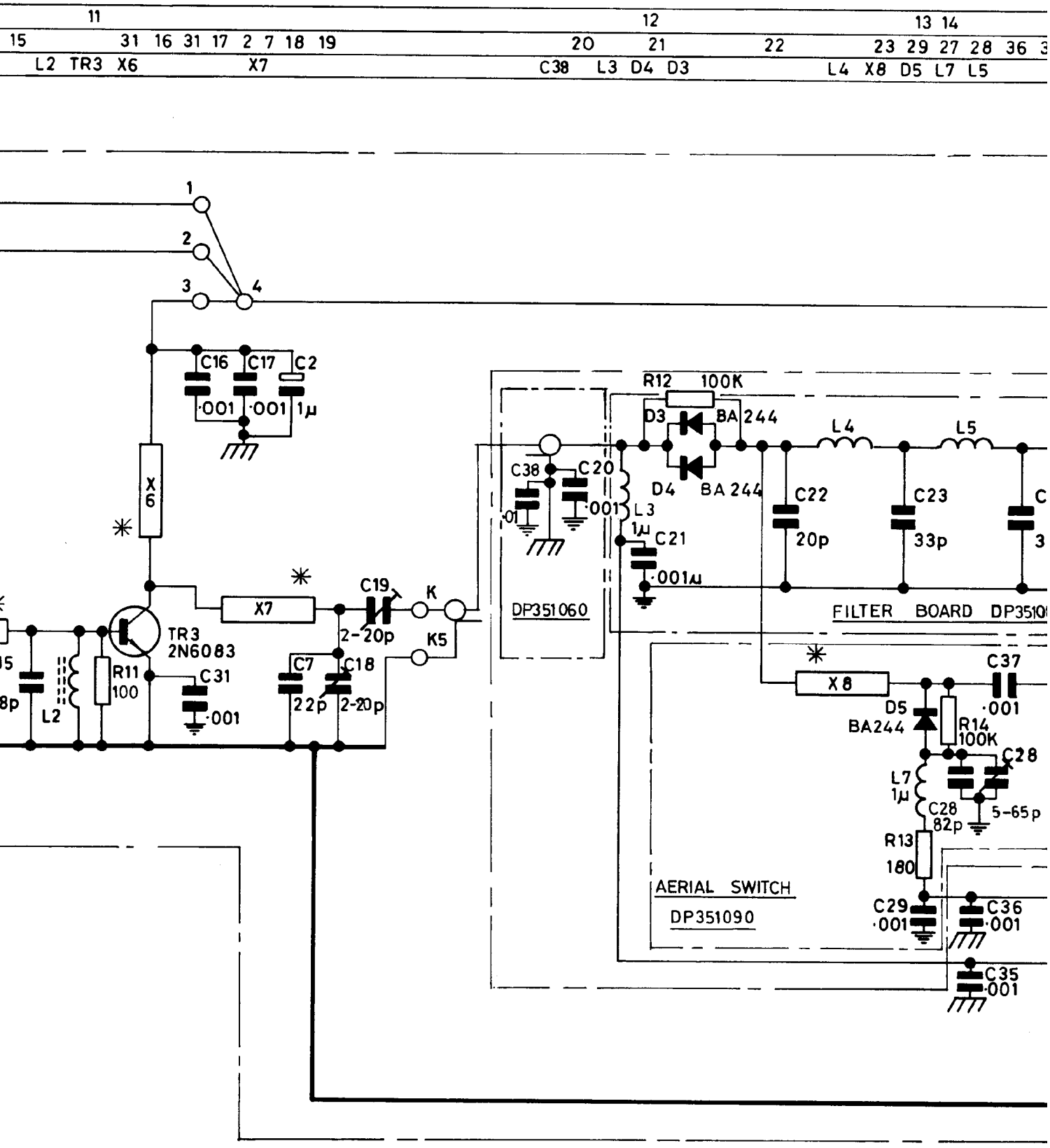


RF BOARD DP351070

Chassis earth

Common negative

Printed lines



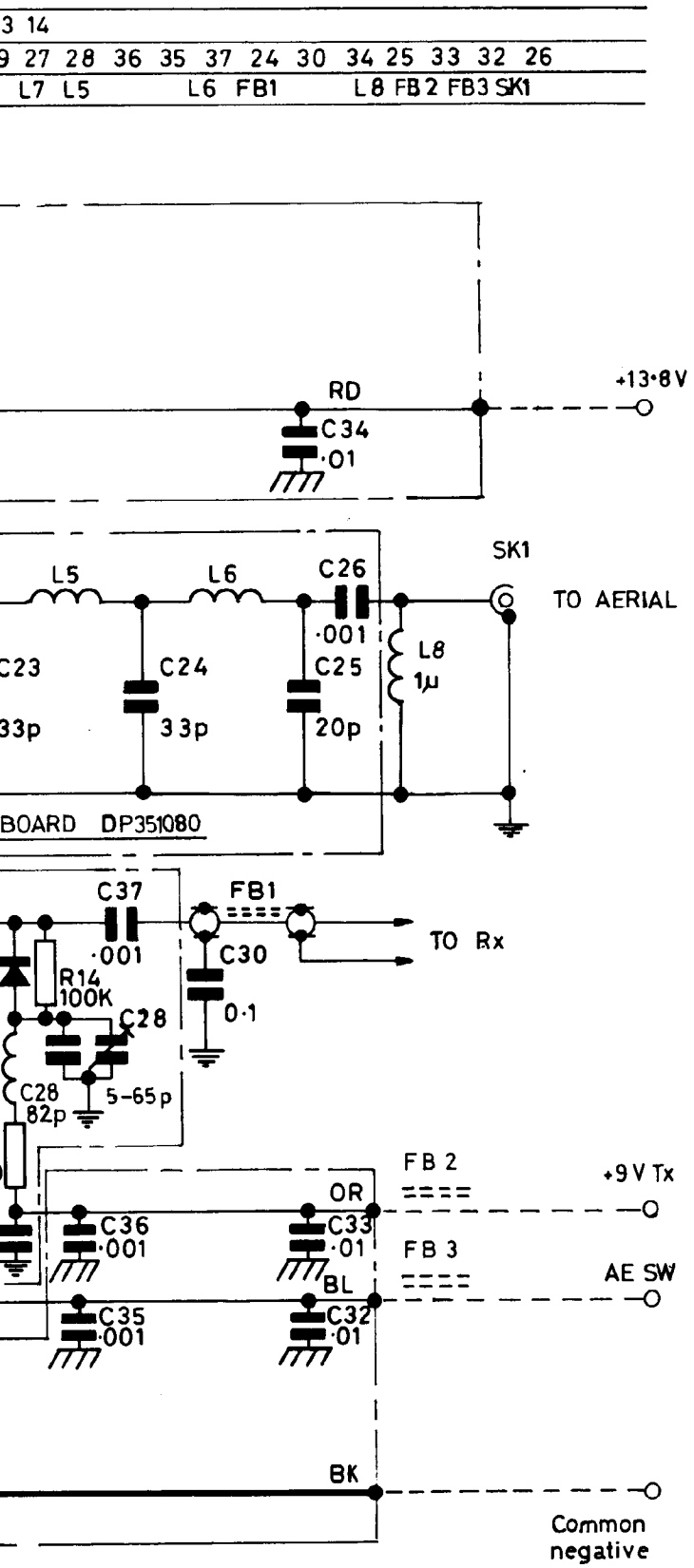
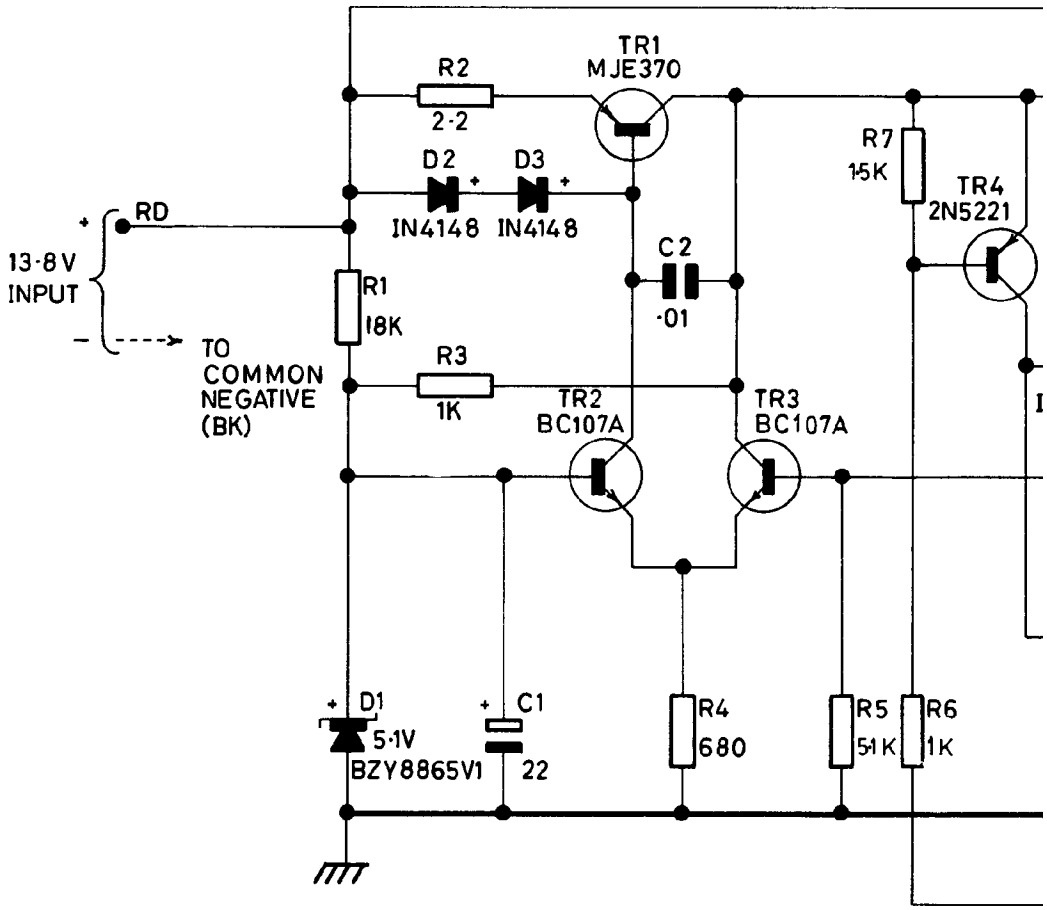


FIG. 18

351030
25 W.
160 MHz
POWER AMPLIFIER (AIRIAL SWITCH & FILTER)
28-LMU-14A

FIG. 18

RESISTORS	1 2 3 4 5 6 7
CAPACITORS	1 2
MISCELLANEOUS	D1 D2 D3 TR2 TR1 TR3 TR4



			4		5	6	7			8	9	10	11	12		13
			2									3				
D3	TR2	TR1	TR3					TR4	D4				TR5	D5	D6	TR6

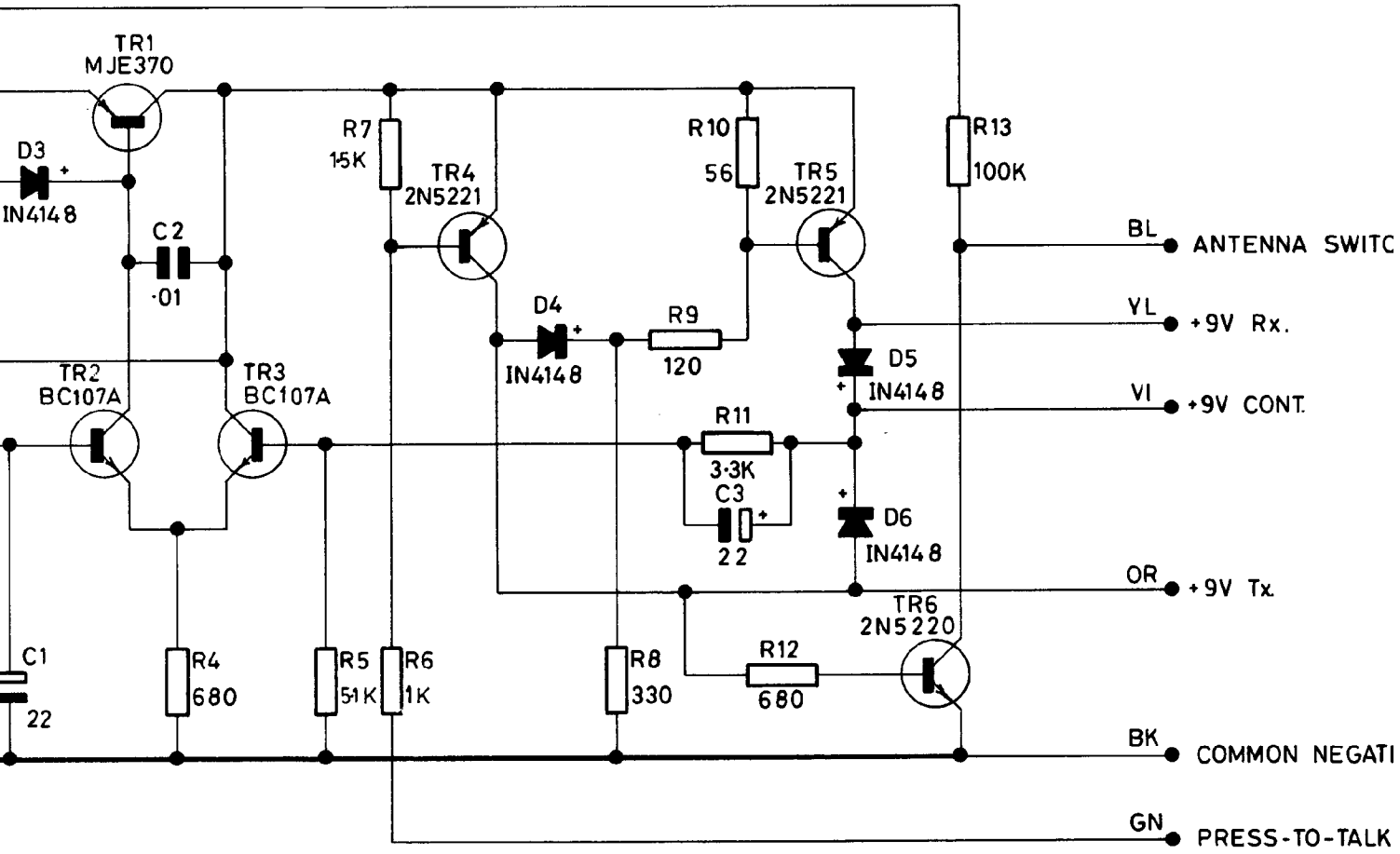


FIG. 19

351130

POWER SUPPLY BOARD

14-LMU-3A

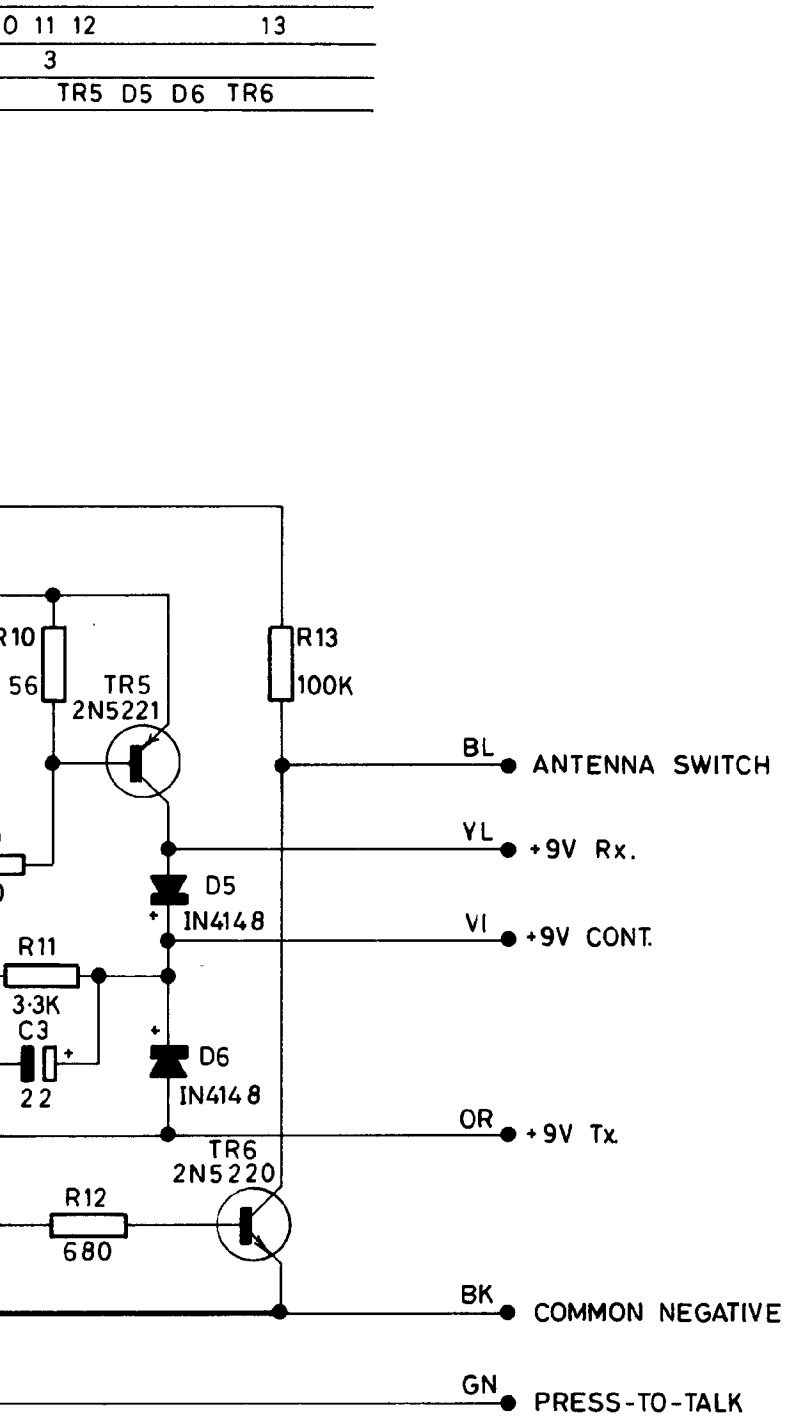
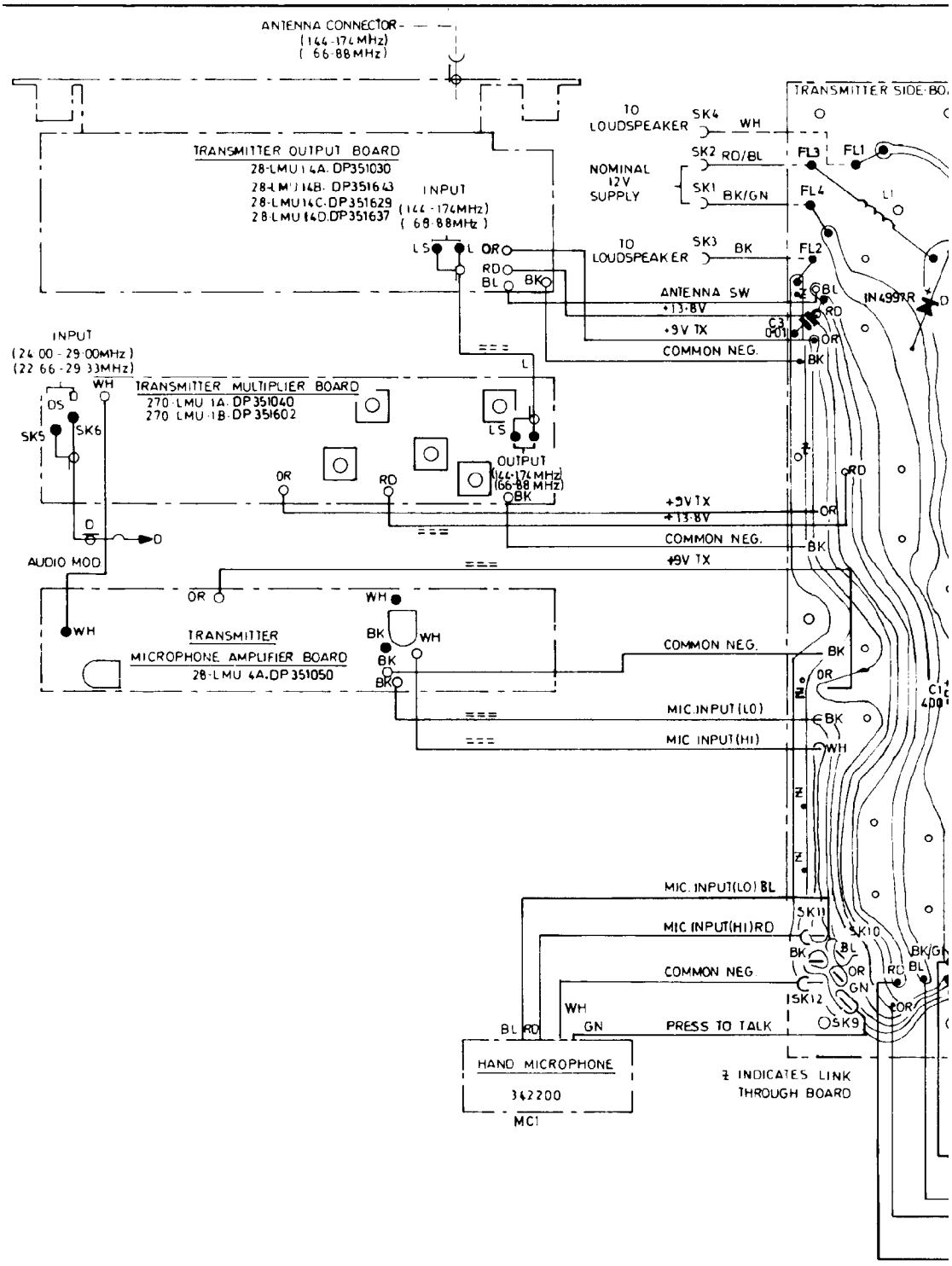


FIG. 19



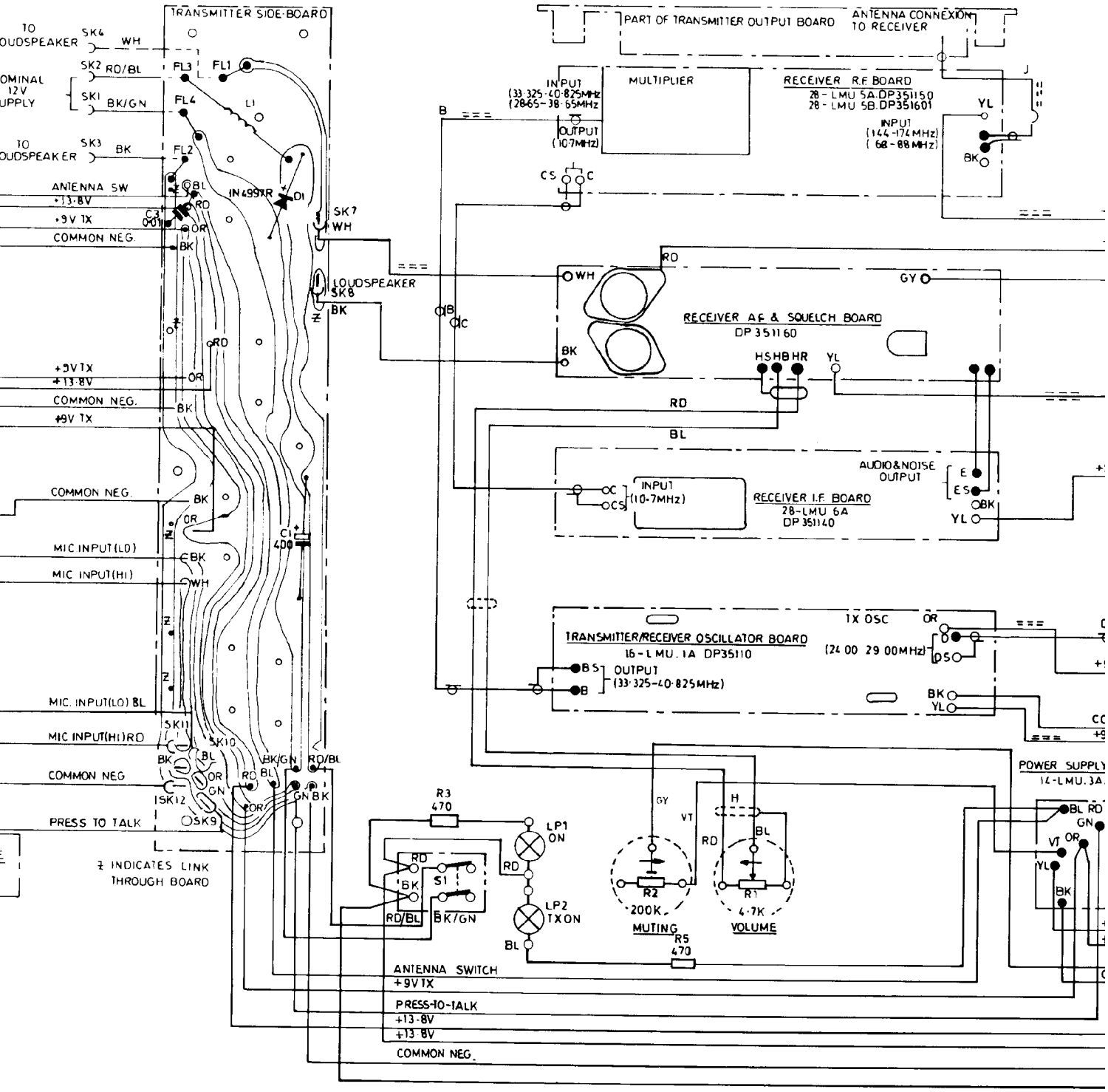


FIG 20

INTERCONNEXION DIAGRAM

SINGLE CHANNEL

HIGH BAND (144-174MHz) LOW BAND (68-88MHz)

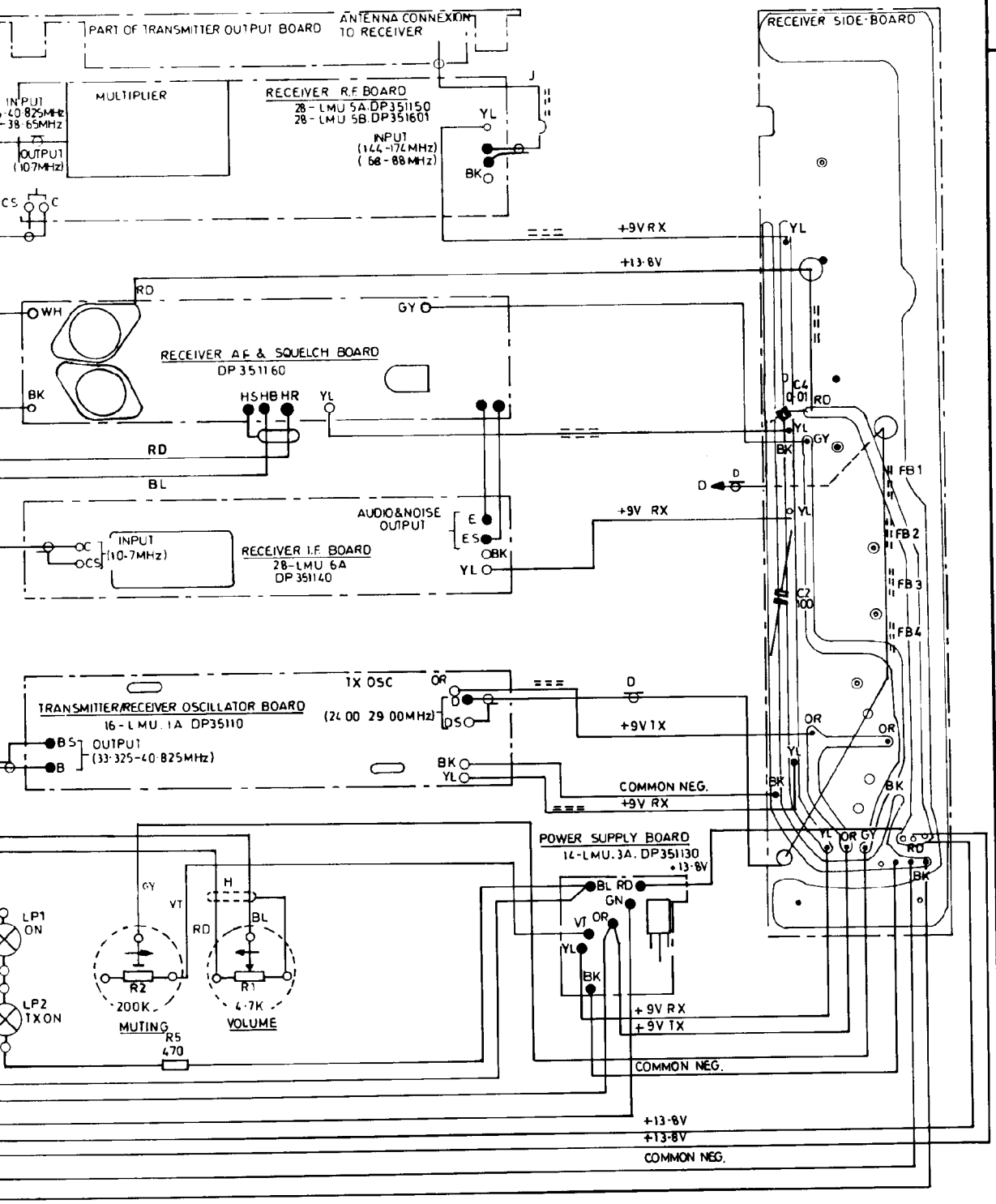
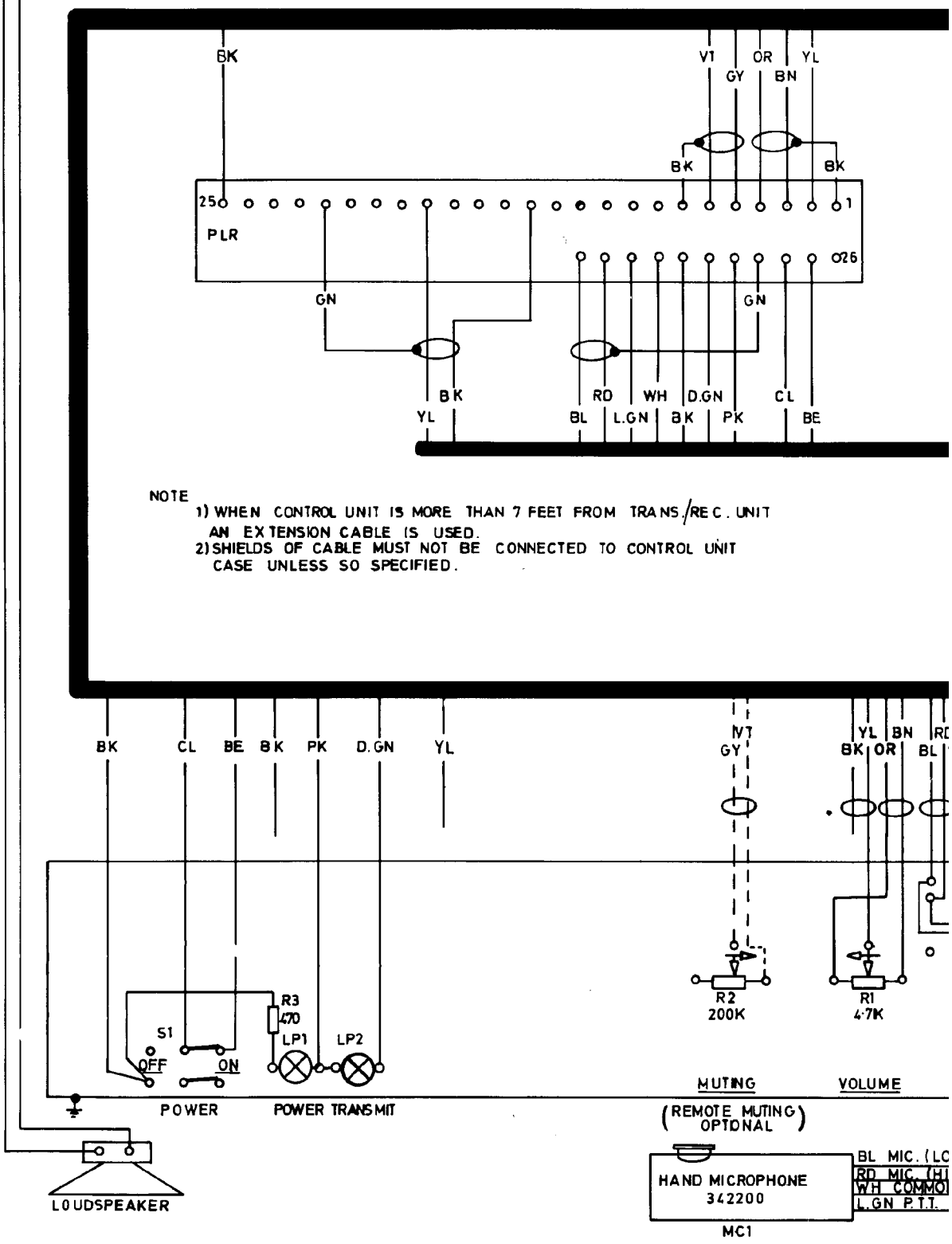
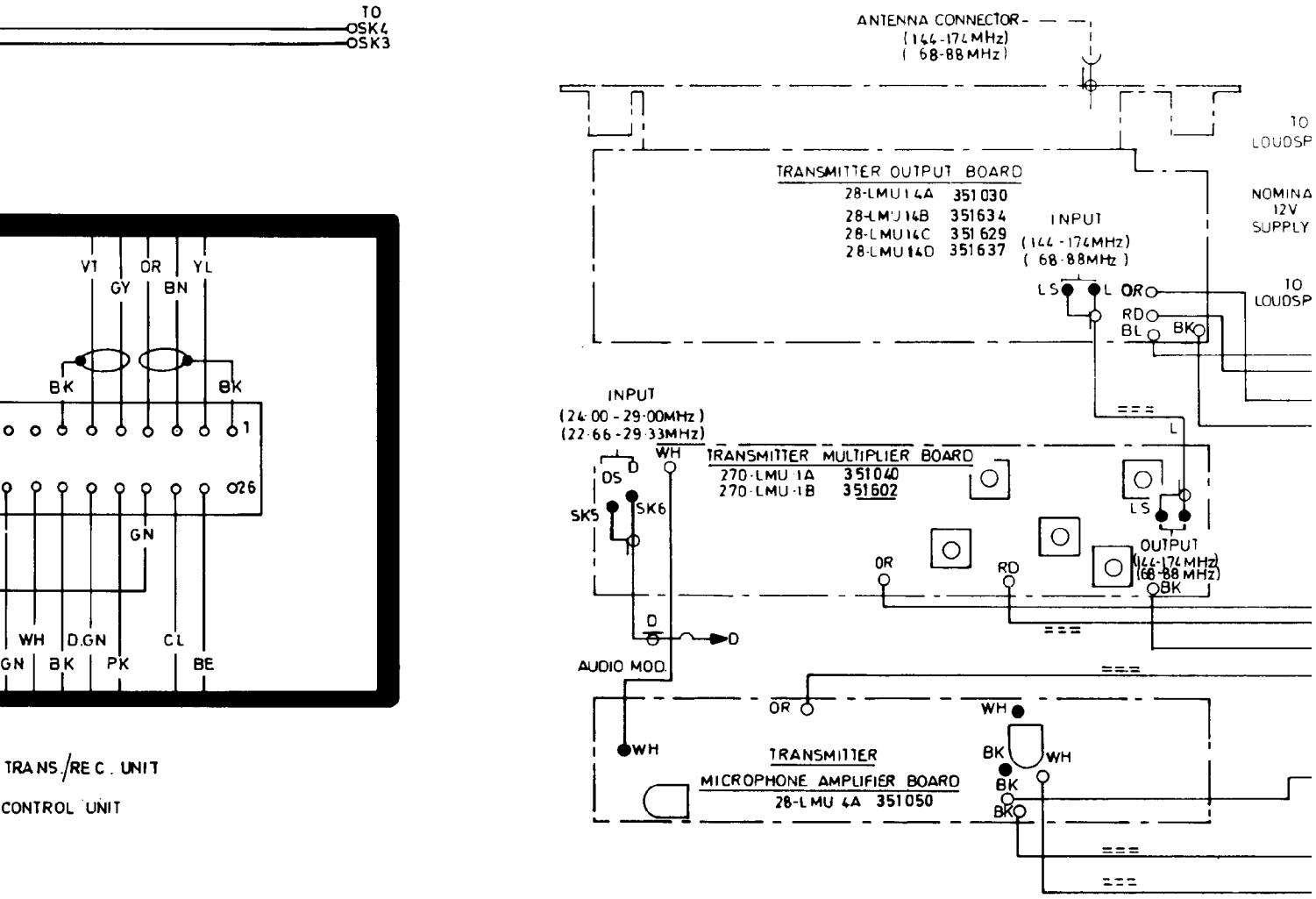


FIG 20





NOTE WHEN USED THE INTERNAL PRESET MUTING POTENTIOMETER CONNECTIONS ARE AS SHOWN.

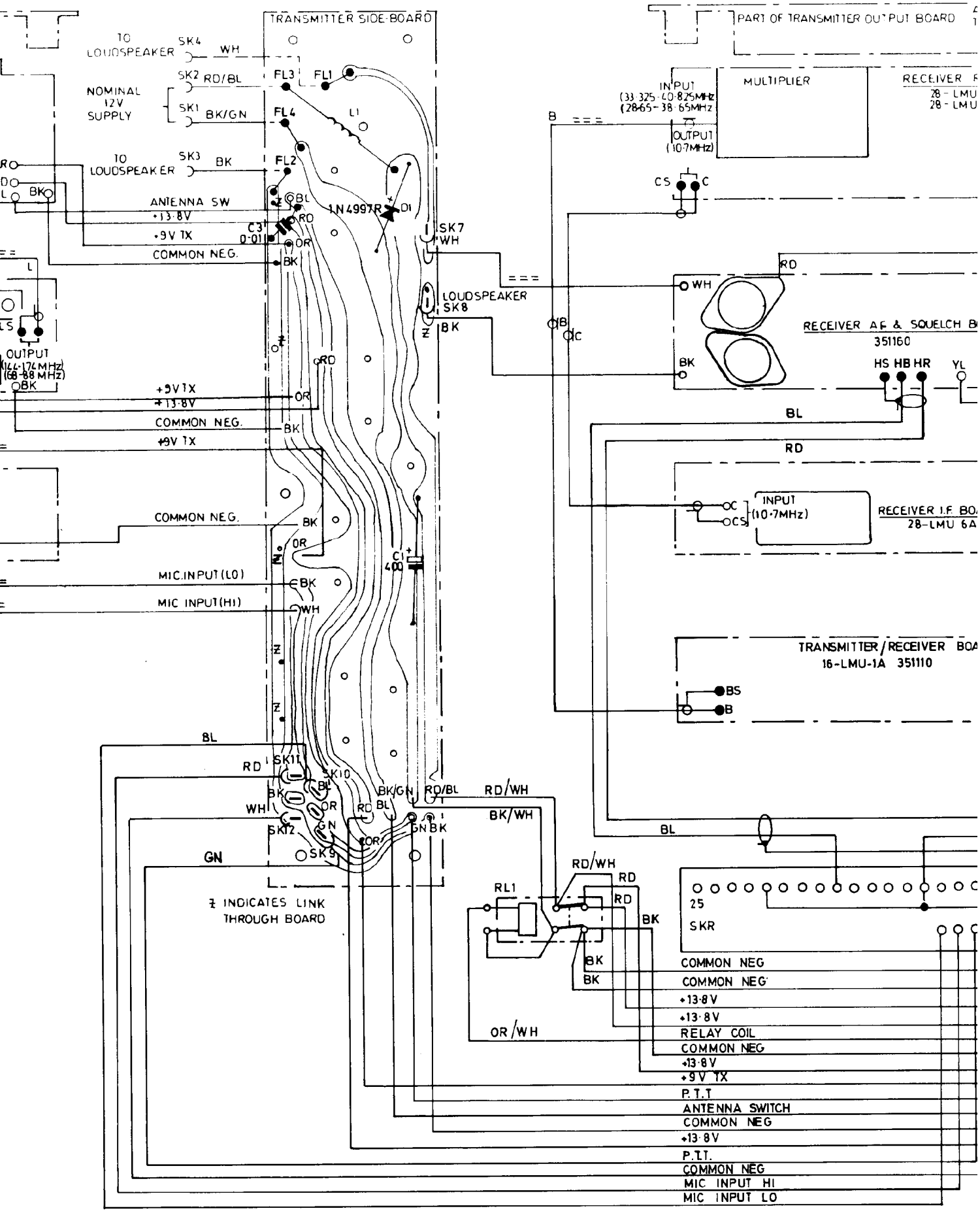


FIG 21

INTERCONNEXION DIAGRAM

SINGLE CHANNEL EXTENDED CONTROL
HIGH BAND (144-174MHz) LOW BAND (68-88MHz)

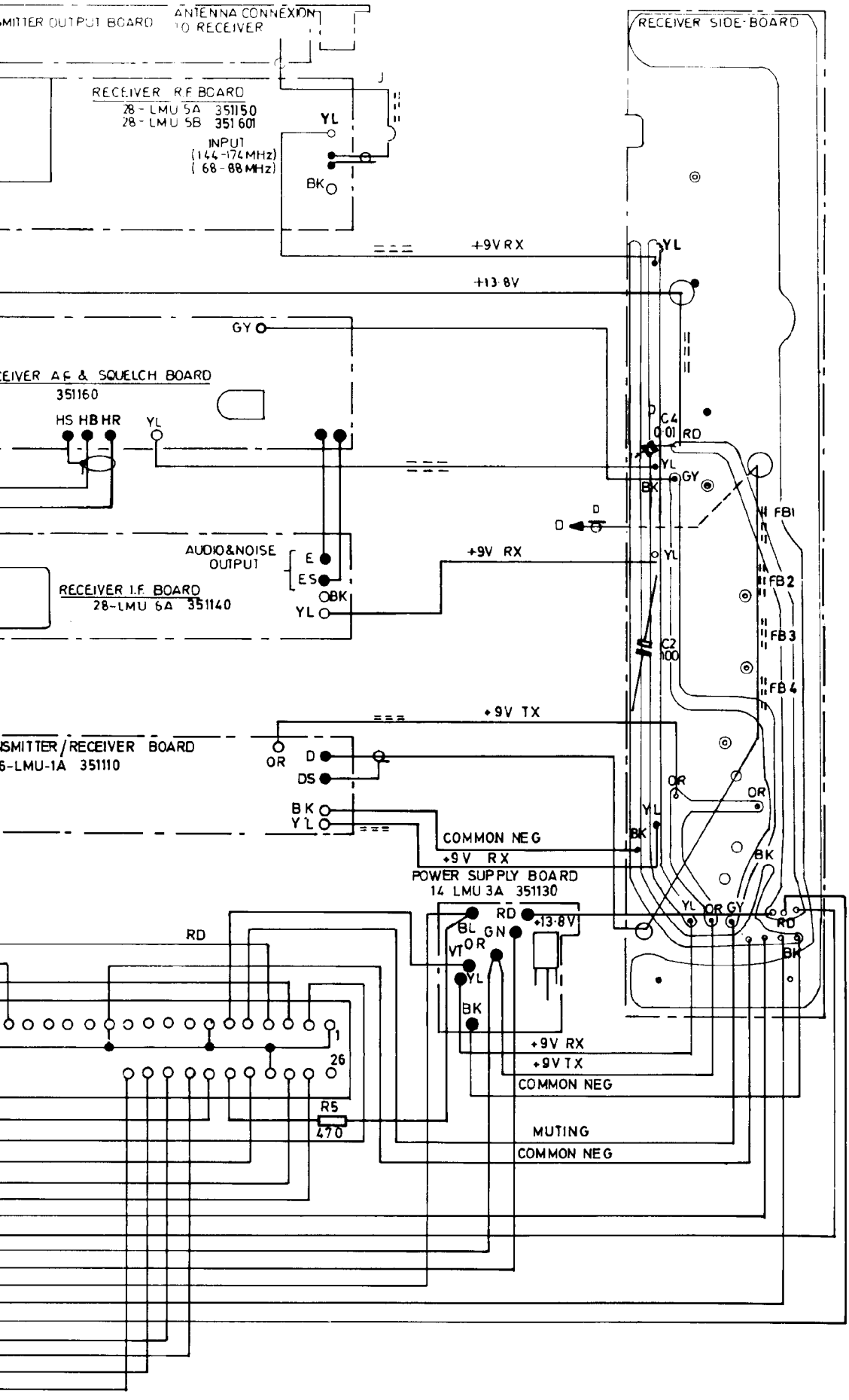
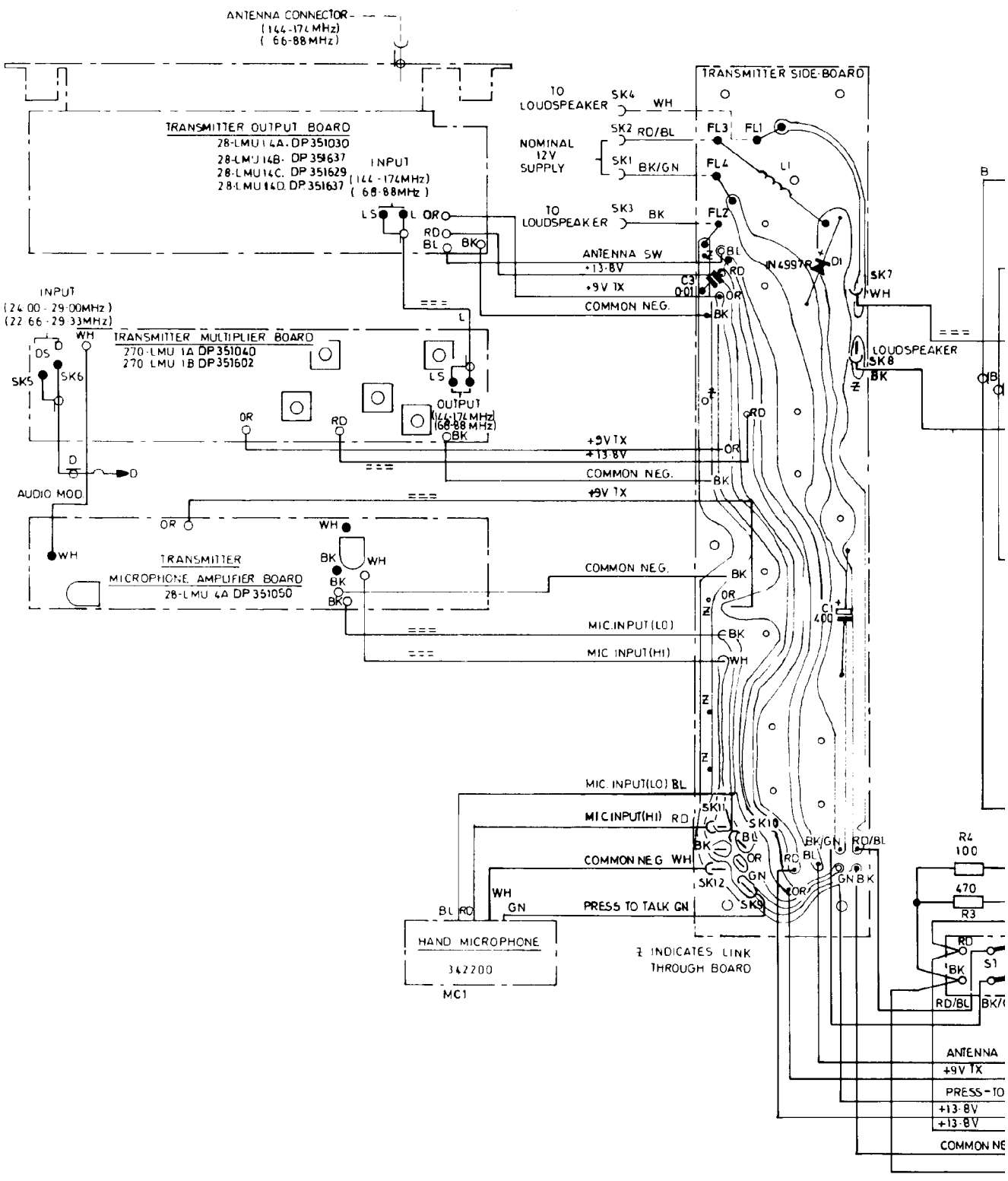


FIG 21



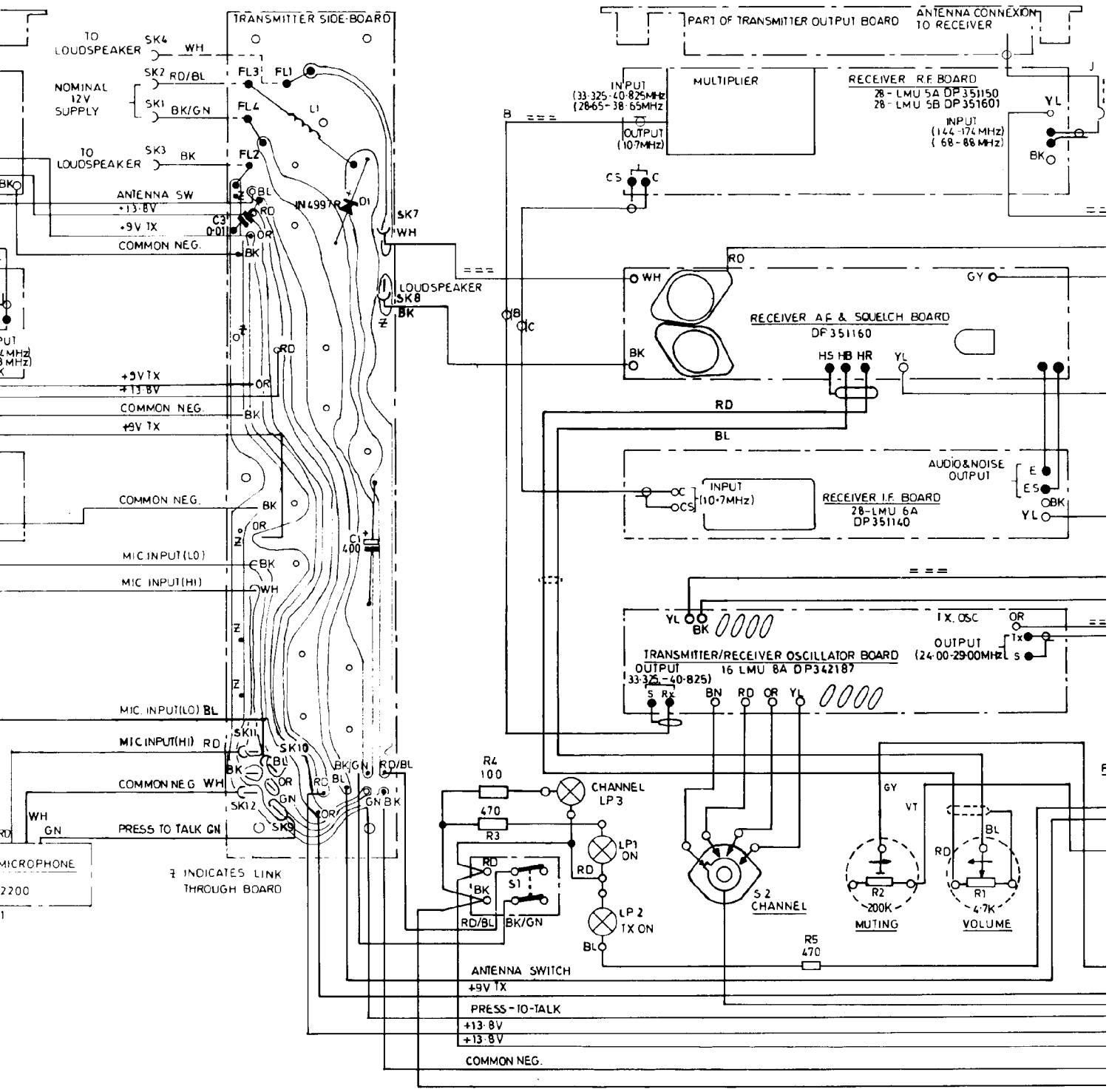


FIG 22

INTERCONNEXION DIAGRAM

FOUR CHANNEL

HIGH BAND (144-174MHz) LOW BAND (66-88MHz)

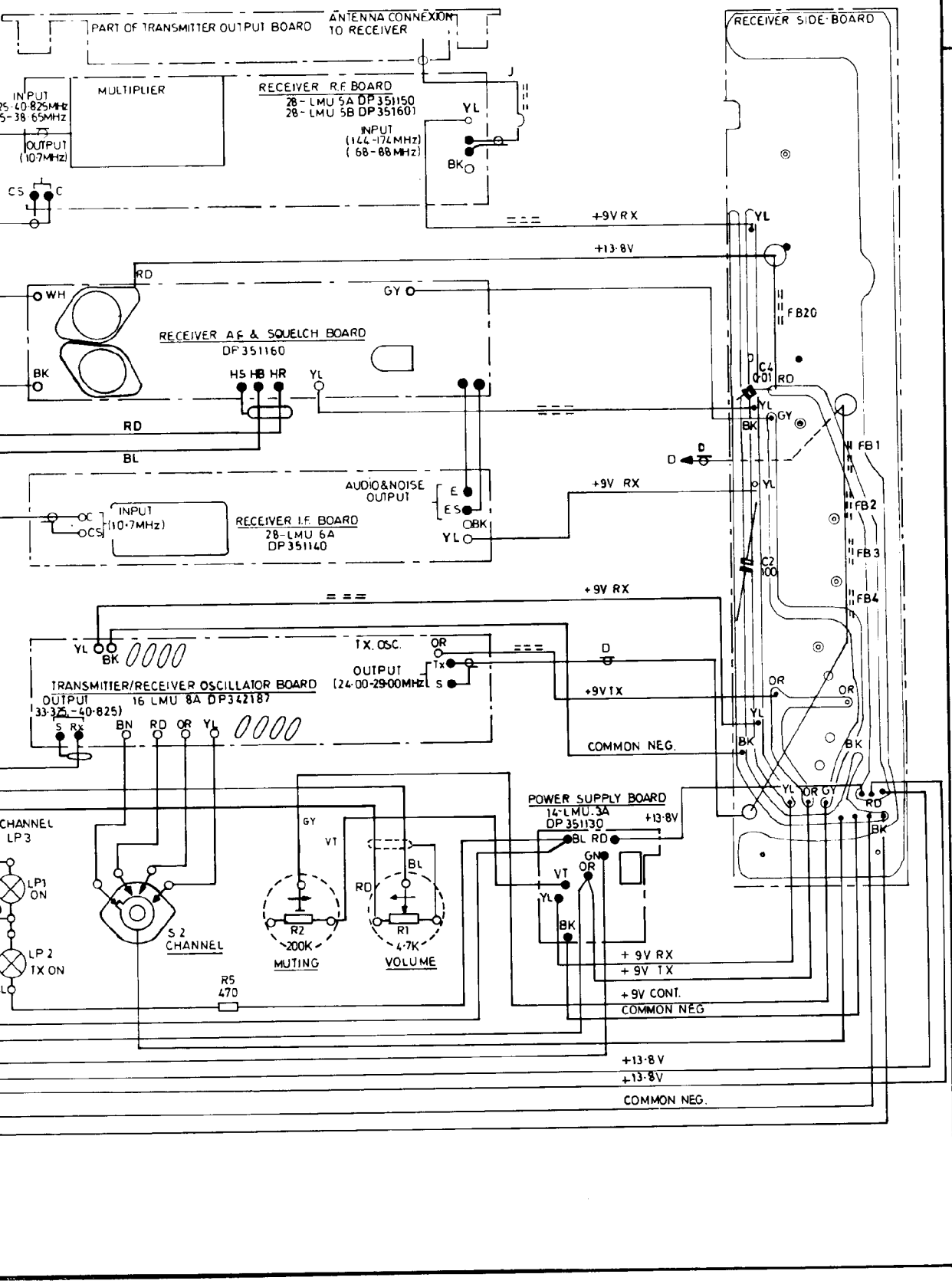
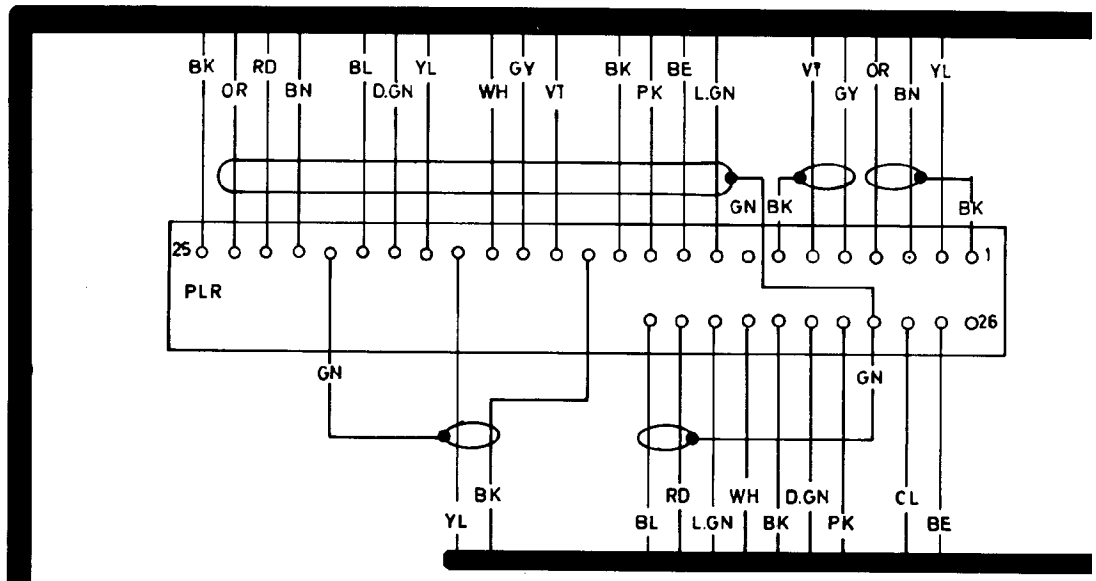
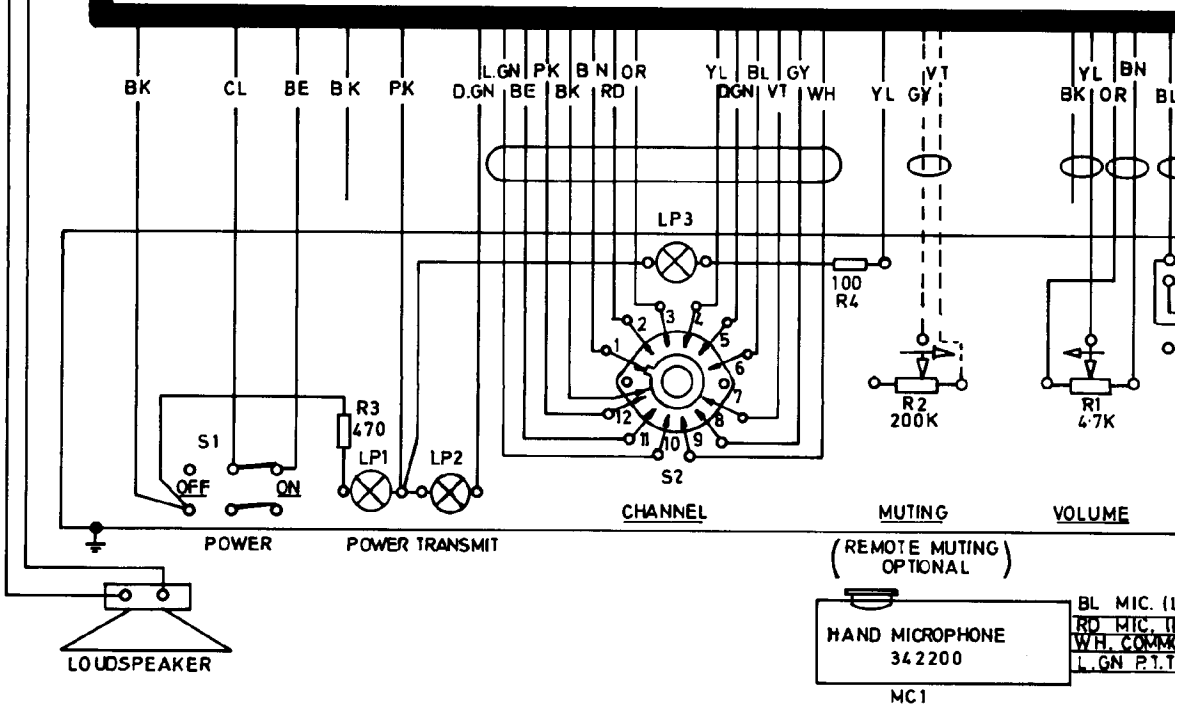


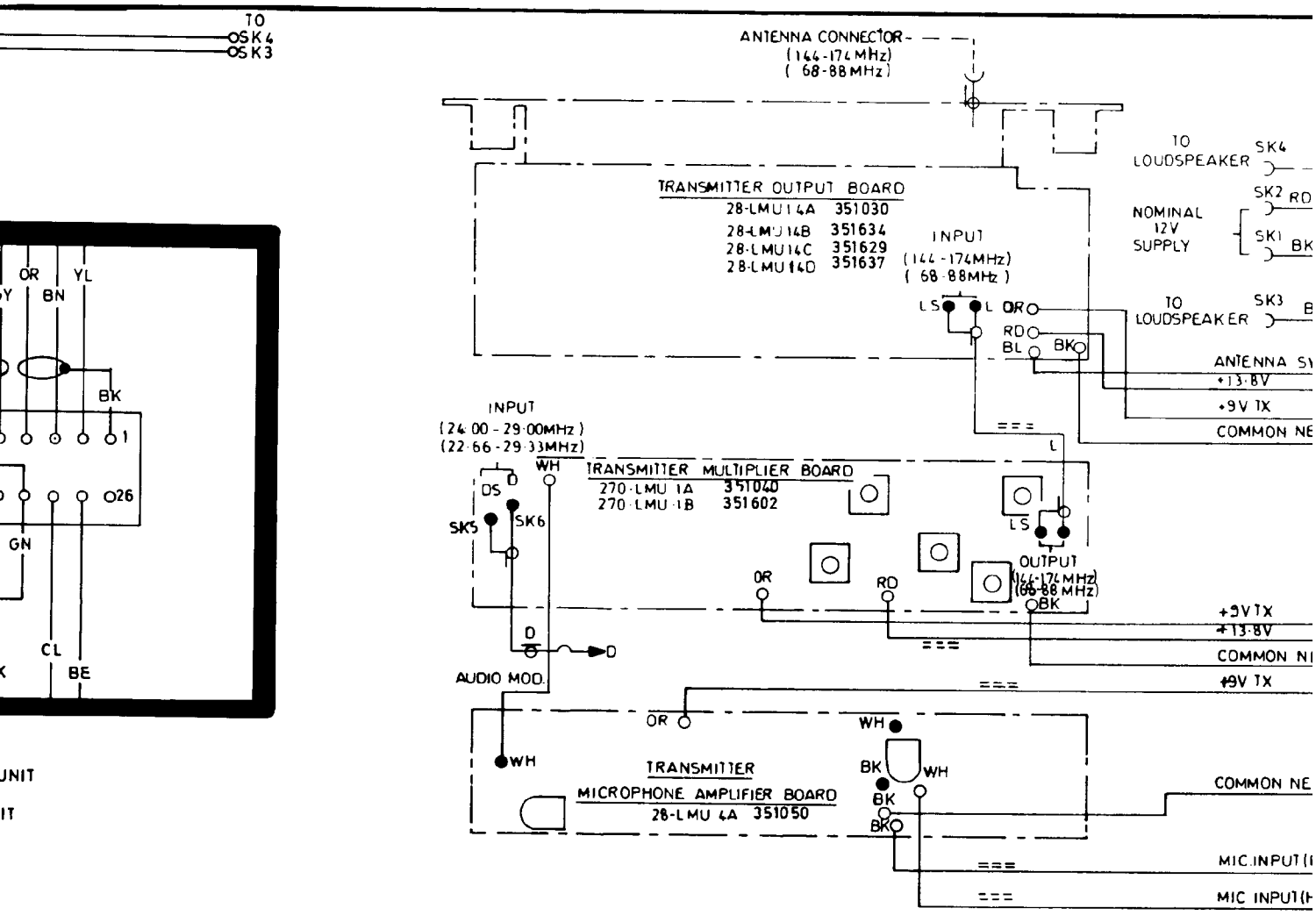
FIG 22



NOTE

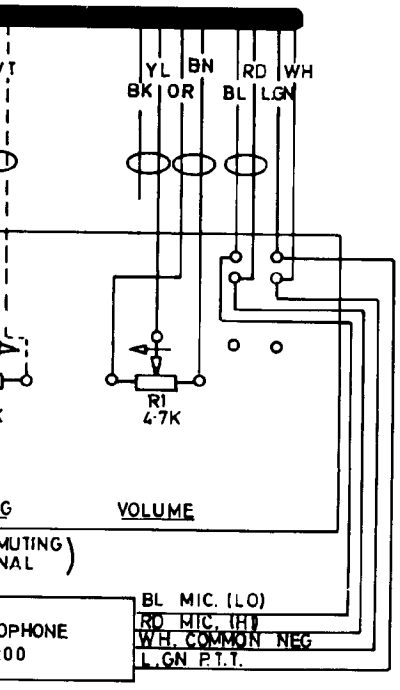
1) WHEN CONTROL UNIT IS MORE THAN 7 FEET FROM TRANS./REC. UNIT AN EXTENSION CABLE IS USED.
2) SHIELDS OF CABLE MUST NOT BE CONNECTED TO CONTROL UNIT CASE UNLESS SO SPECIFIED.

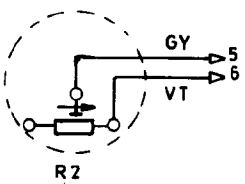




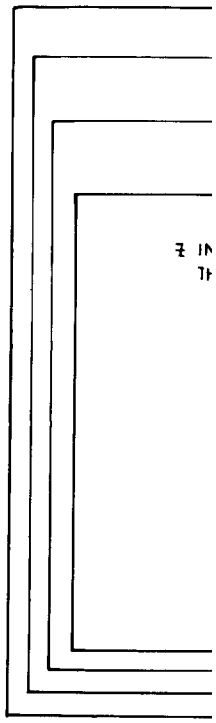
UNIT

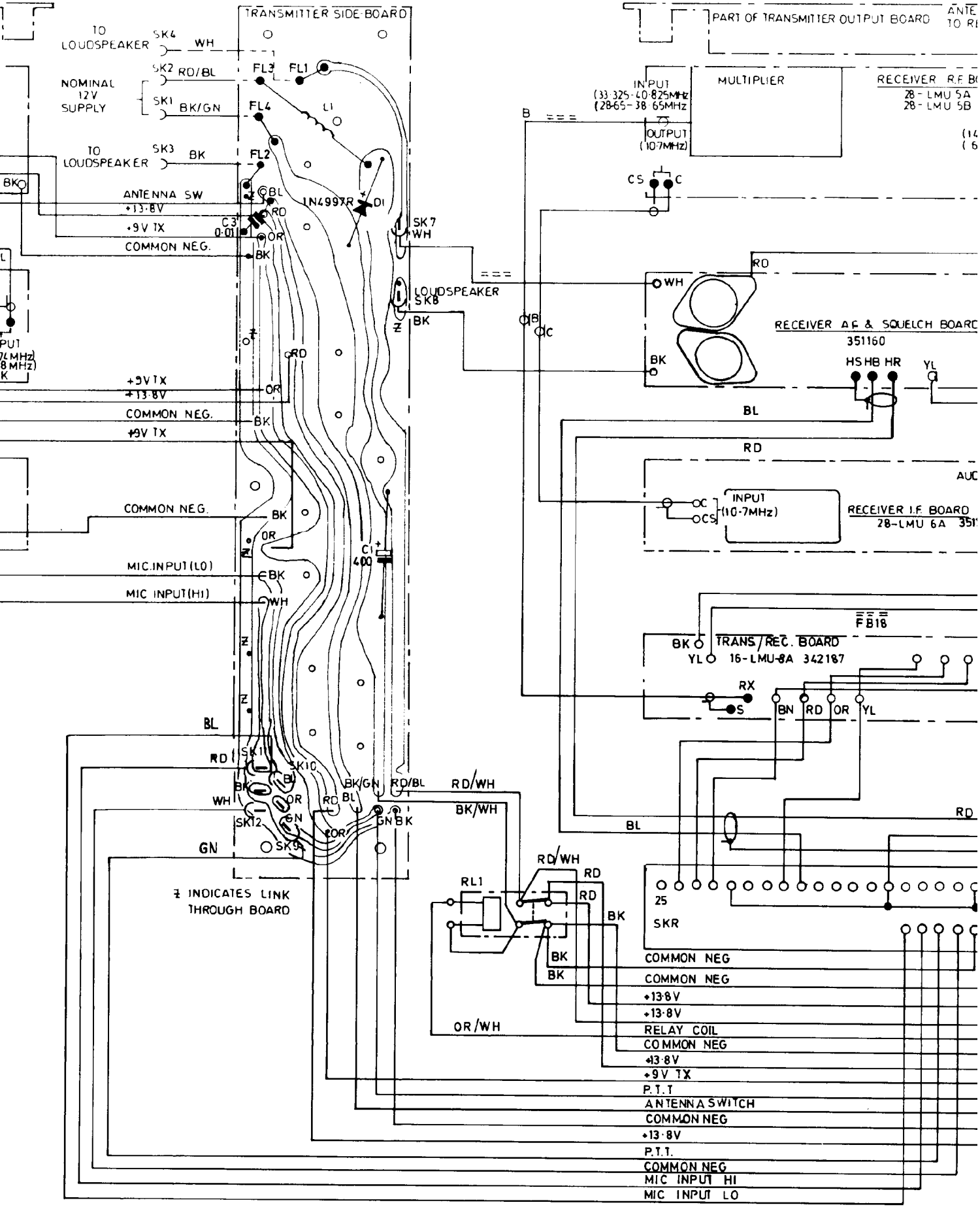
IT

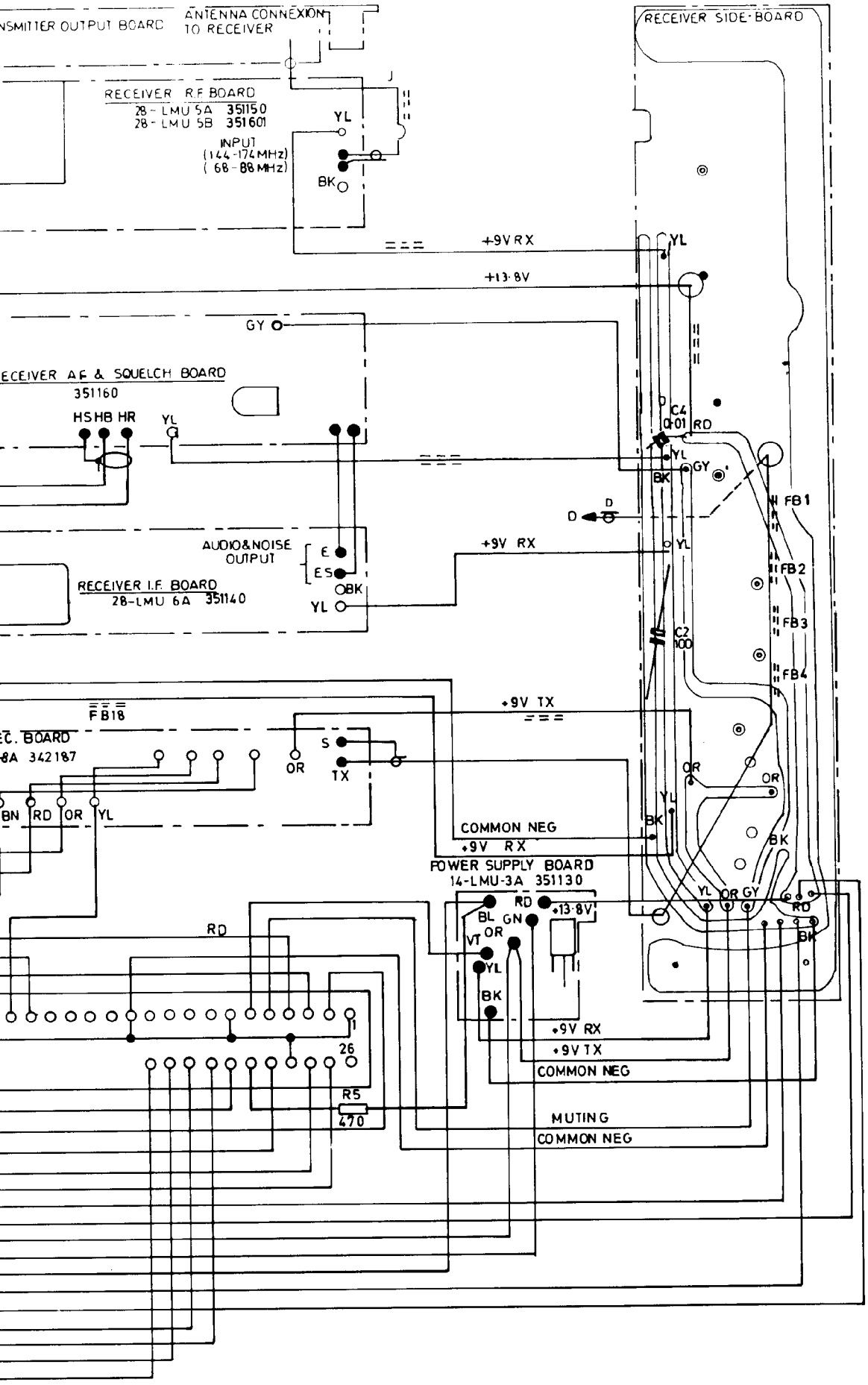




NOTE WHEN USED THE INTERNAL PRESET MUTING POTENTIOMETER CONNECTIONS ARE AS SHOWN.







INTERCONNEXION DIAGRAM

4-CHANNEL EXTENDED CONTROL

HIGH BAND (144-174MHz) LOW BAND (68-88MHz)

FIG 23

FIG 23

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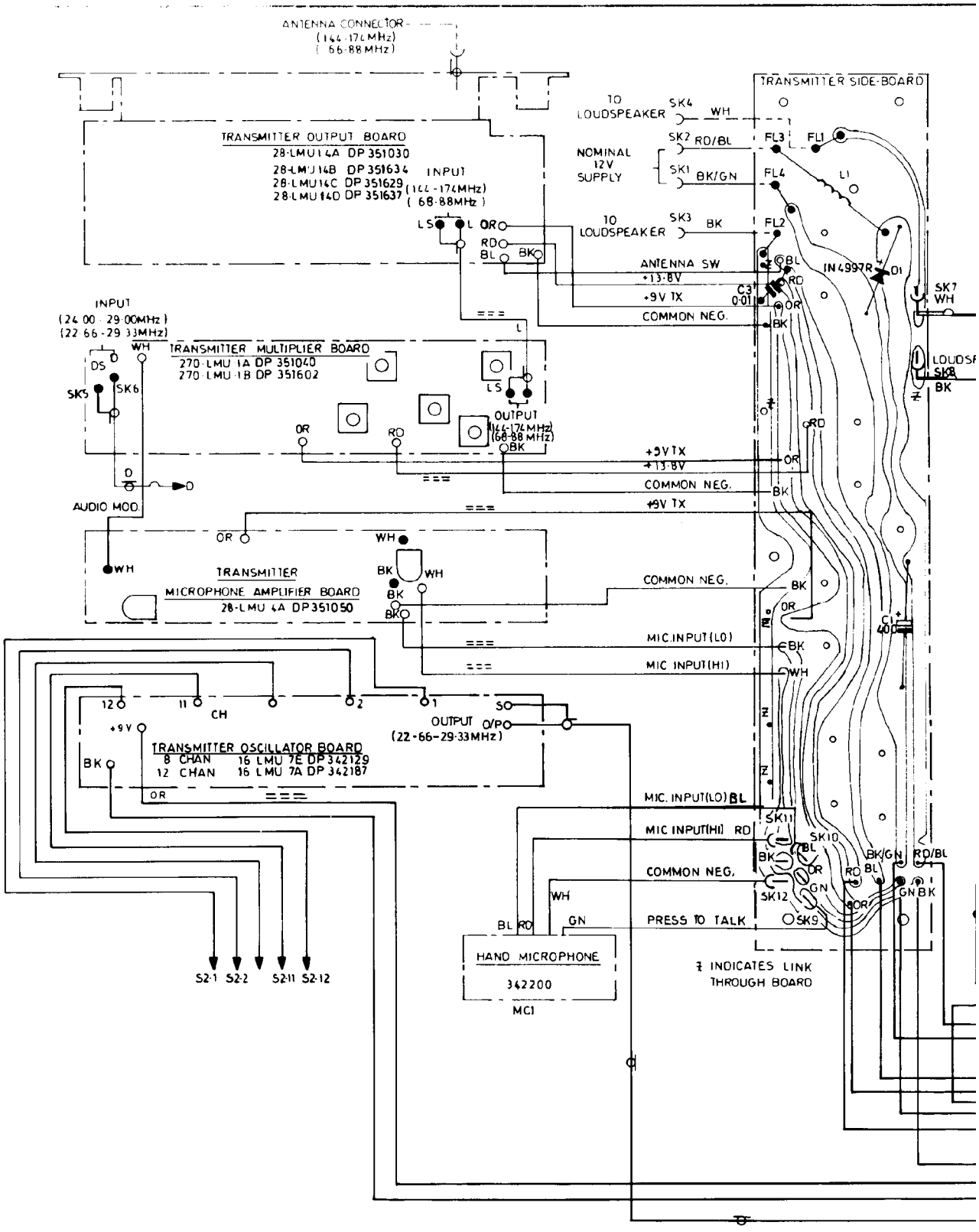


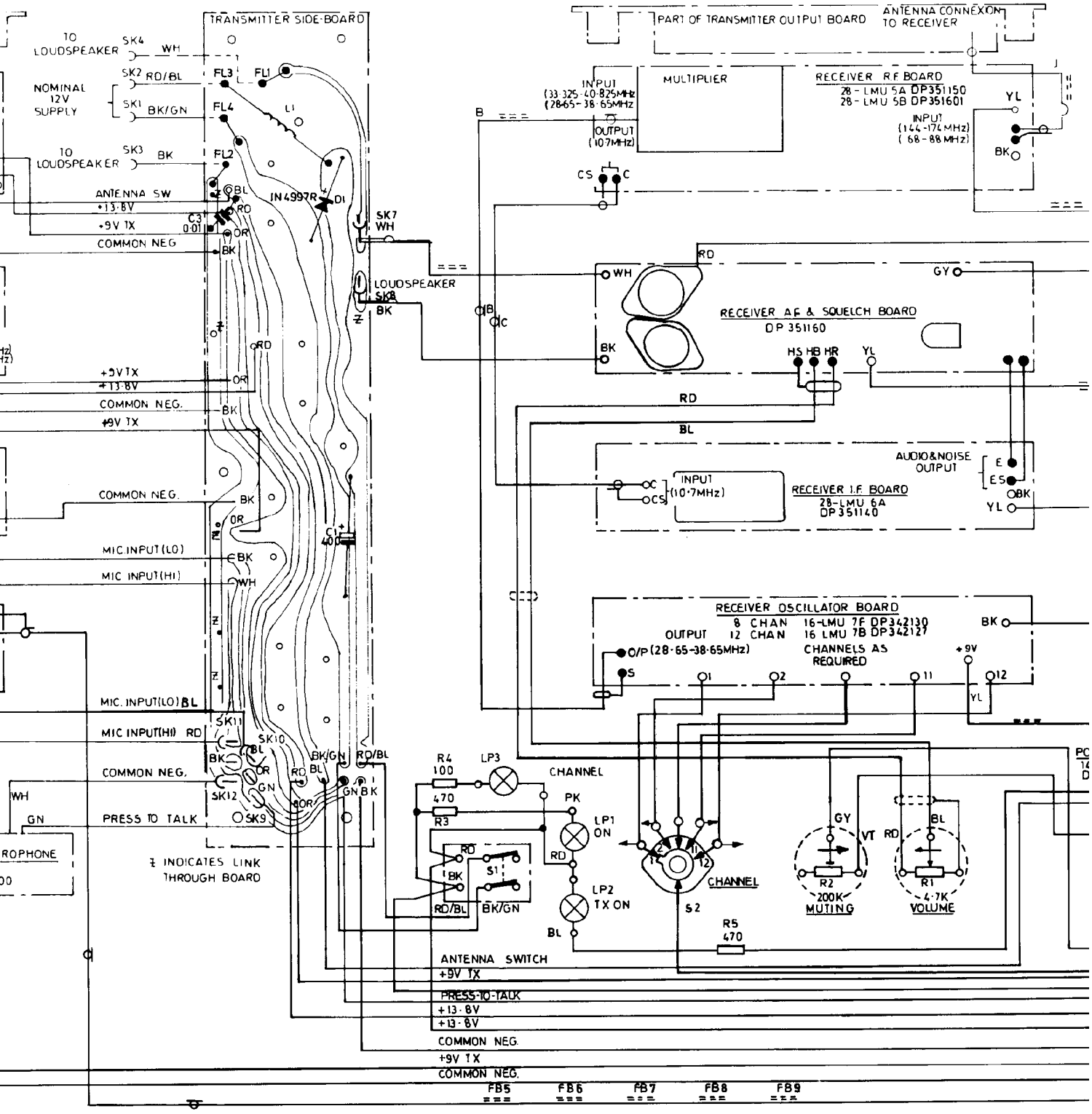


FIG 24

INTERCONNEXION DIAGRAM

MULTI CHANNEL

HIGH BAND (144-174MHz) LOW BAND (68-88MHz)

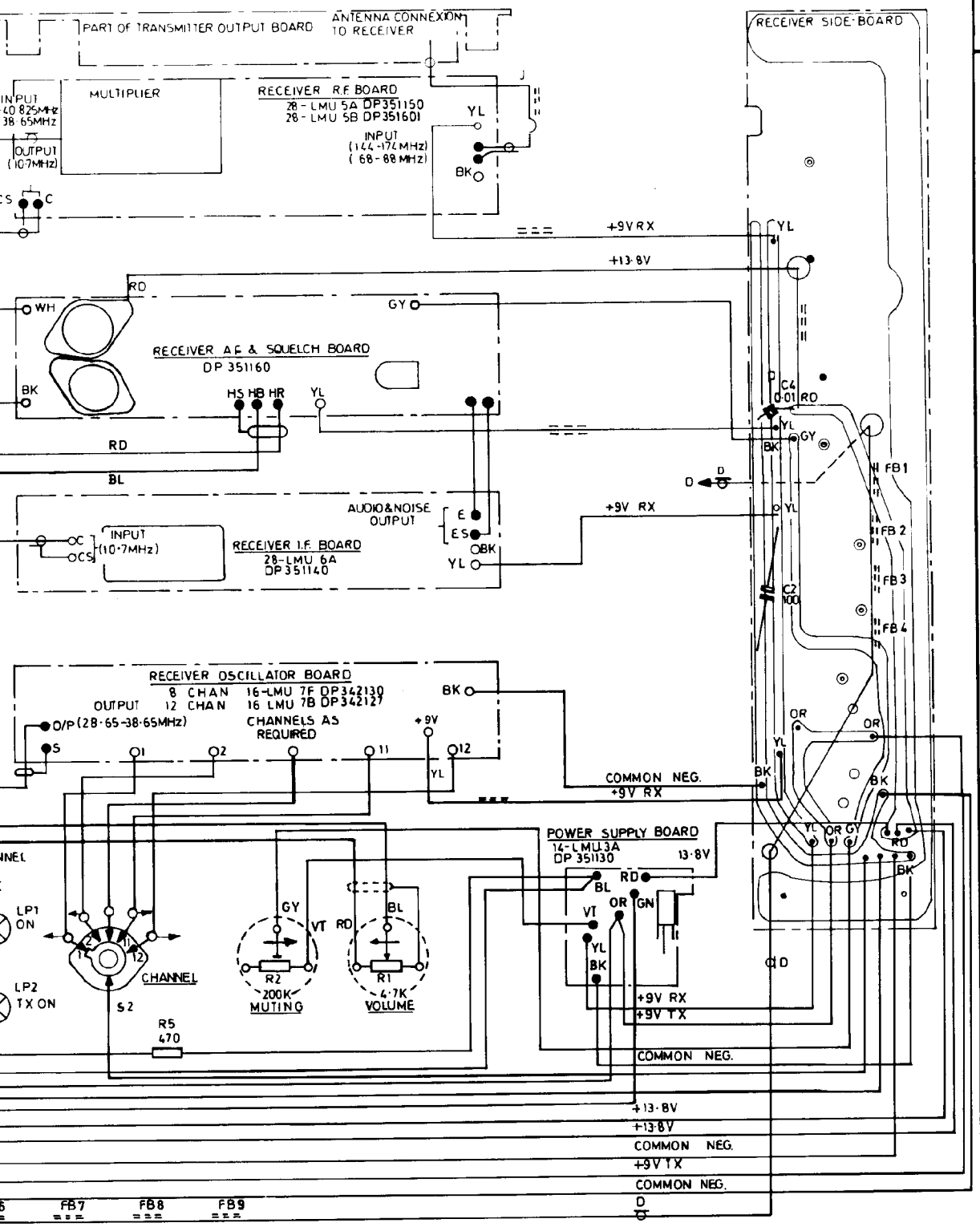
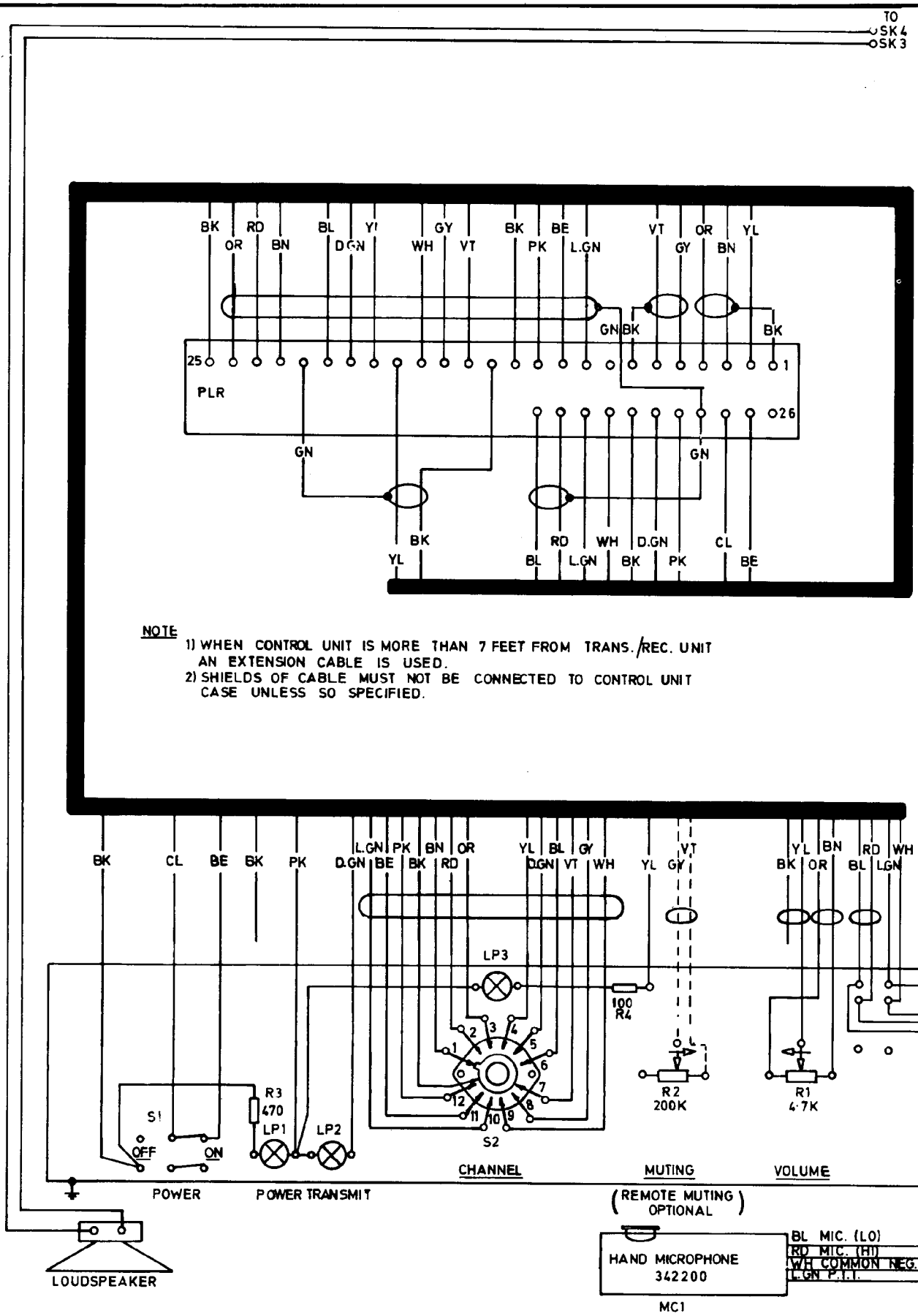
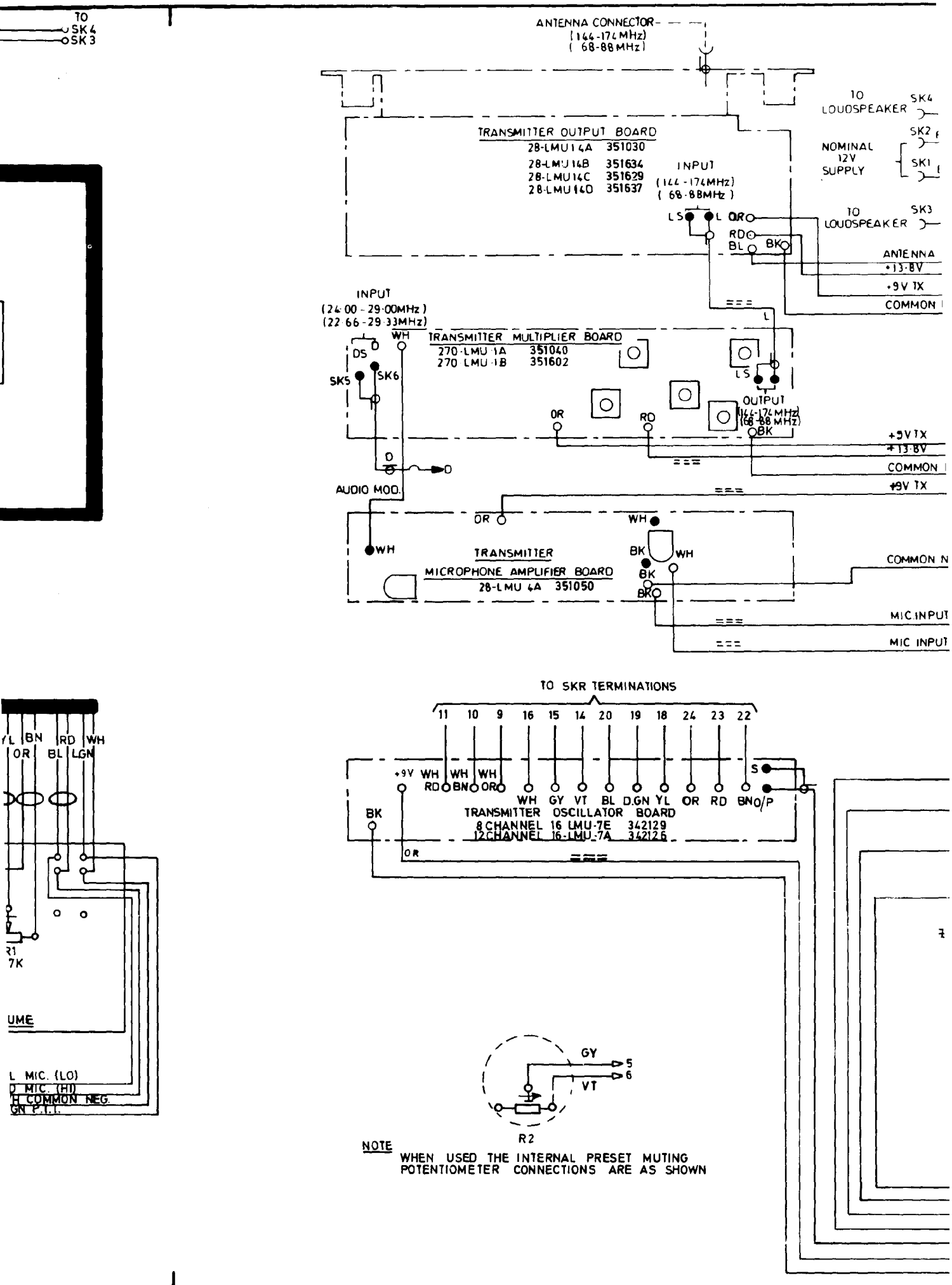


FIG 24





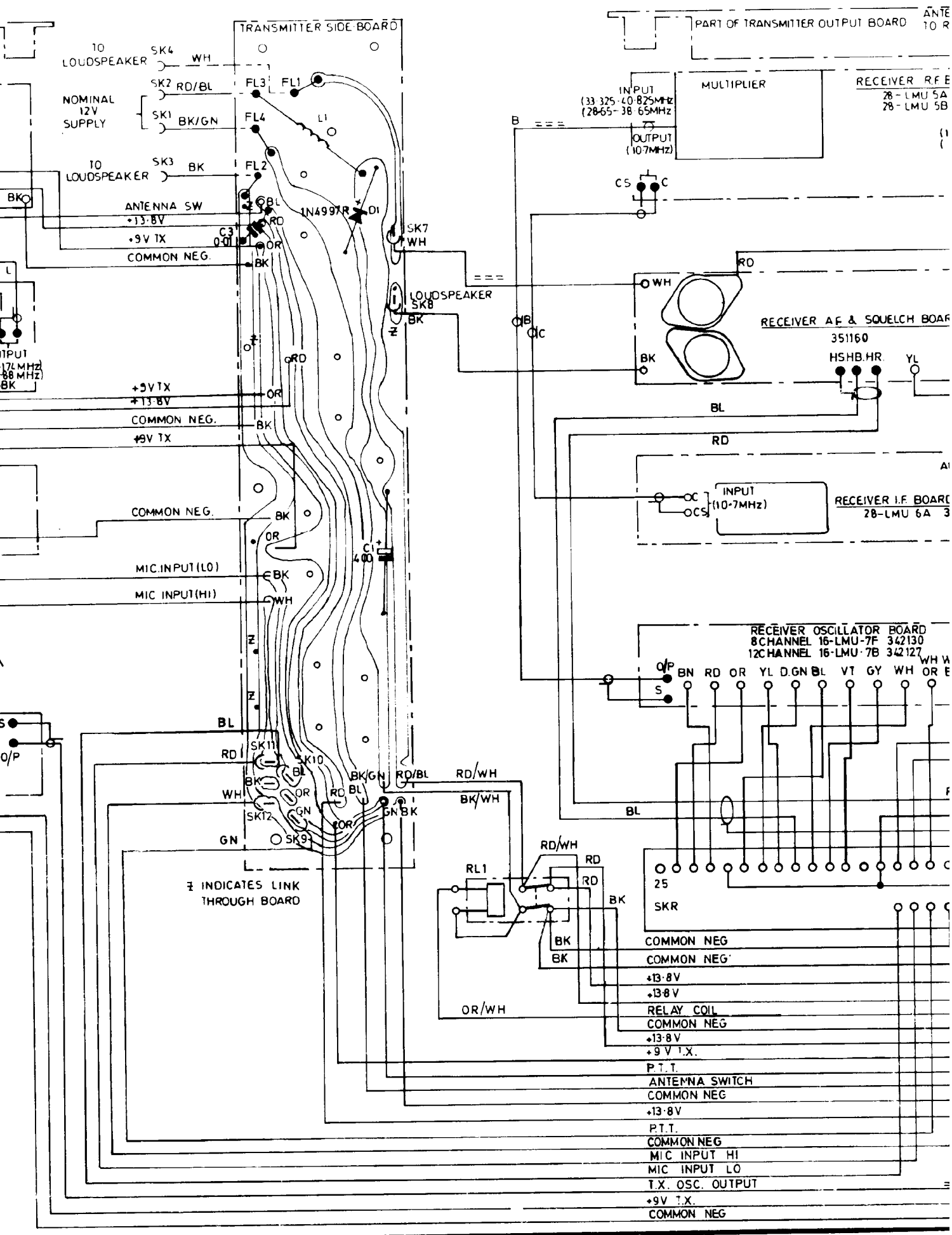
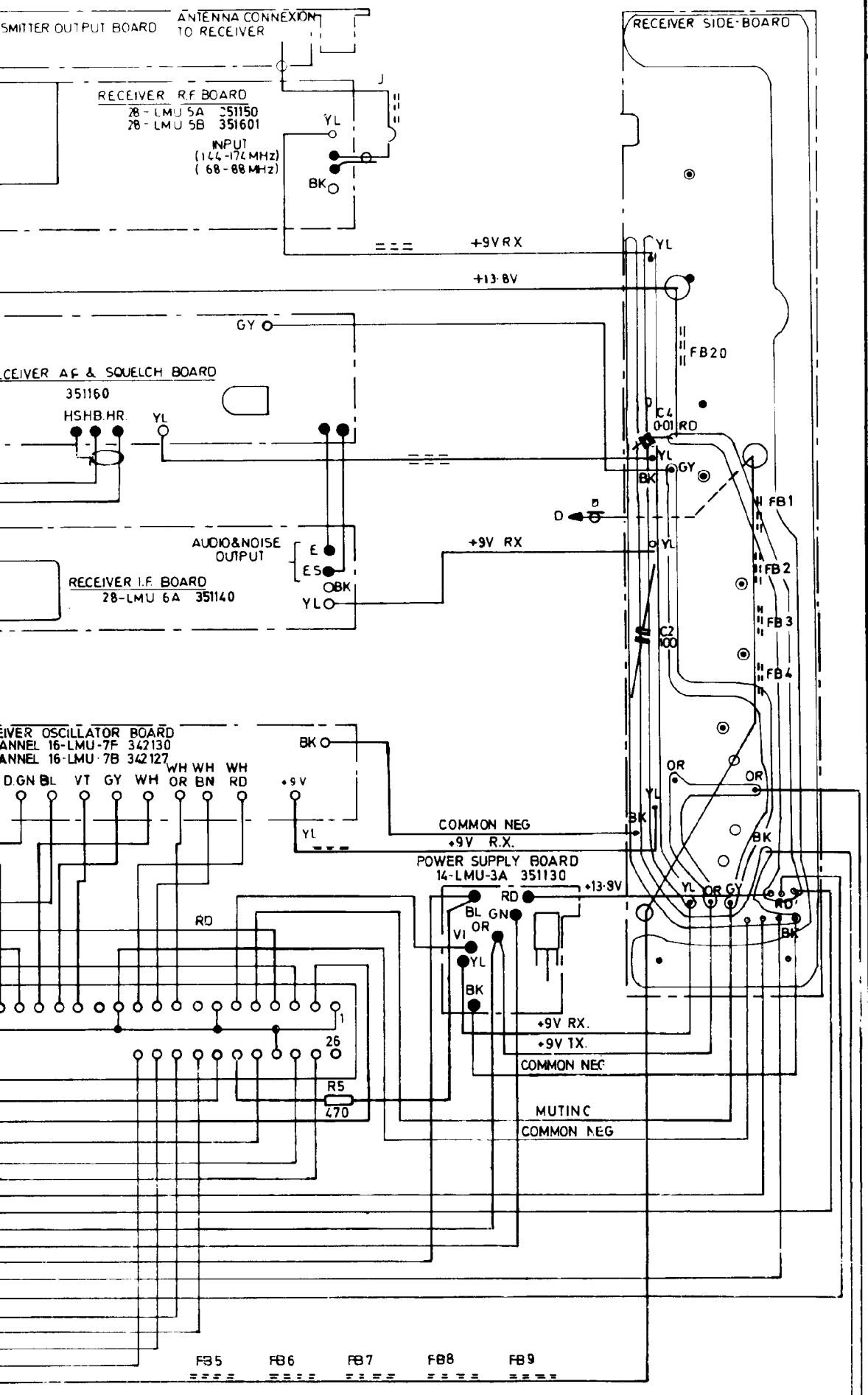


FIG 25

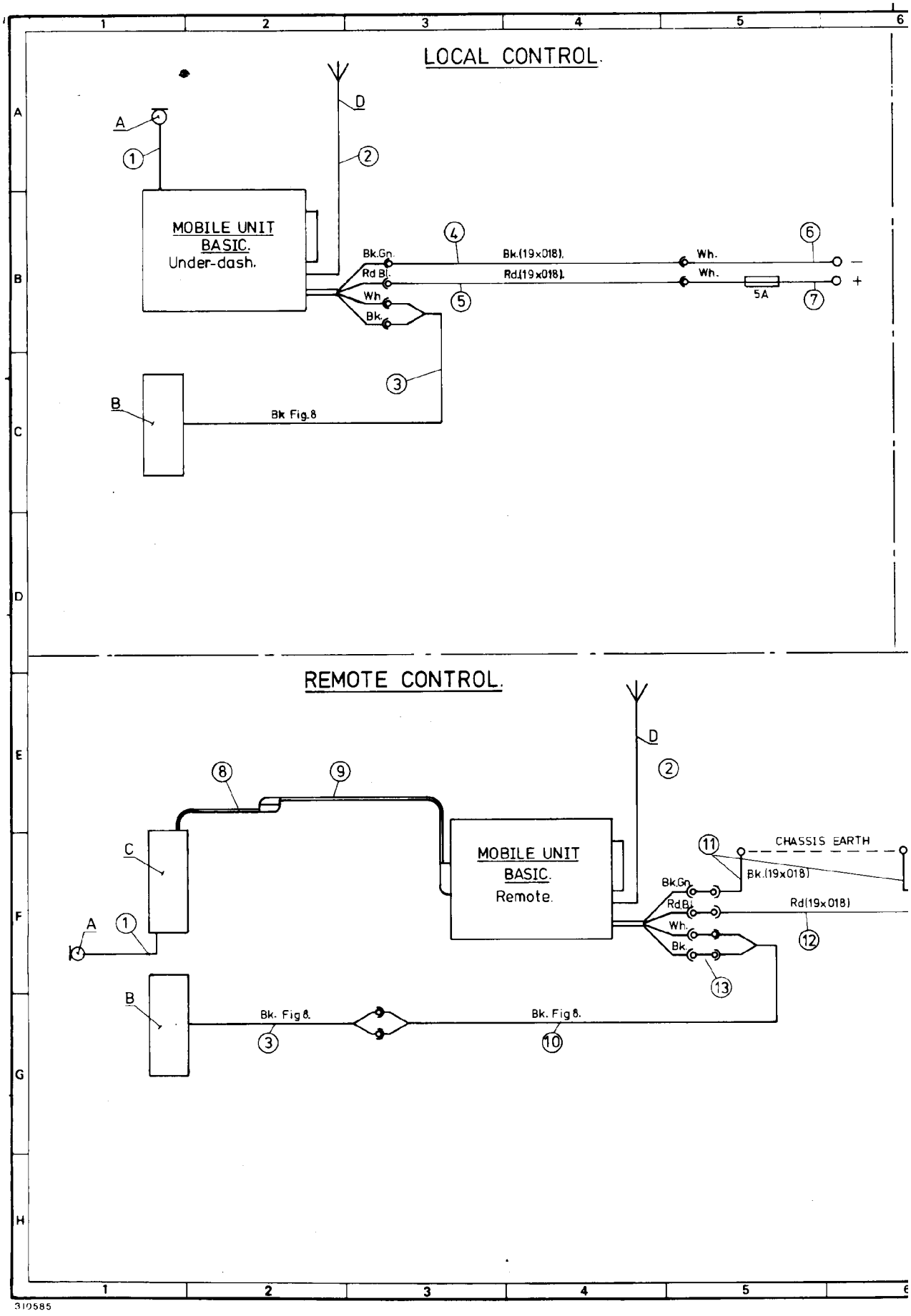


INTERCONNEXION DIAGRAM

MULTI-CHANNEL EXTENDED CONTROL

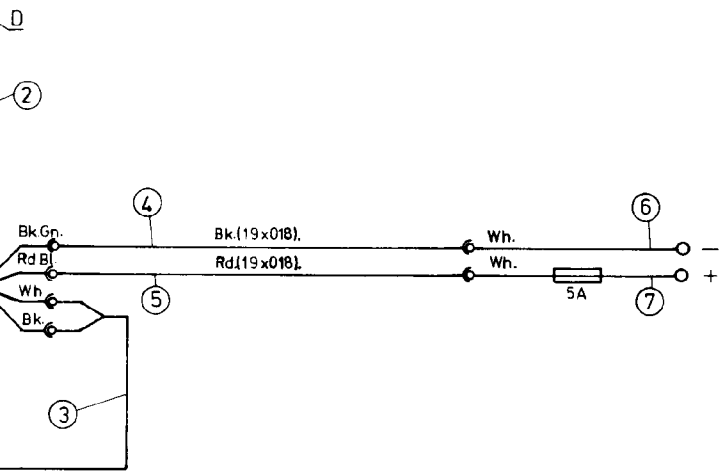
HIGH BAND (144-174MHz) LOW BAND (68-88MHz)

FIG 25

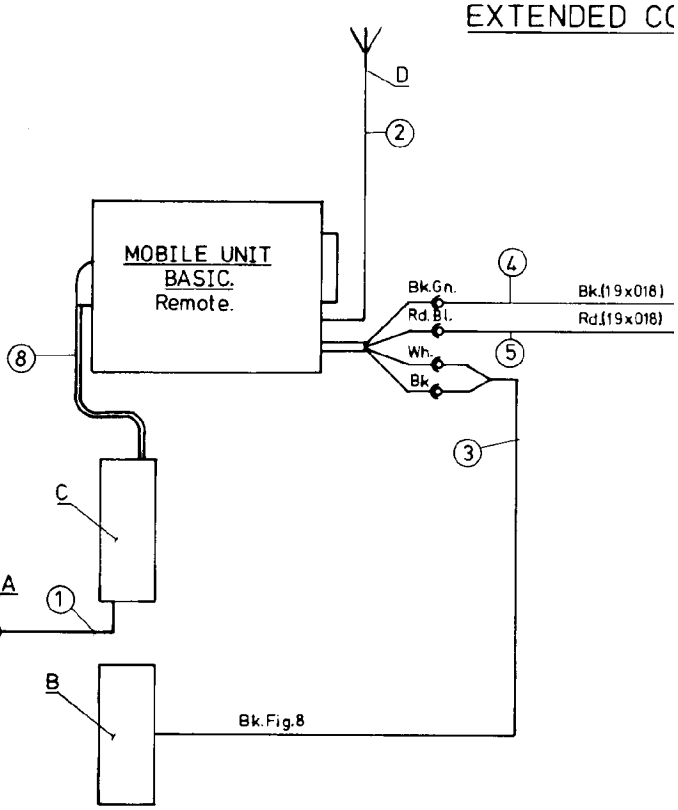


310585

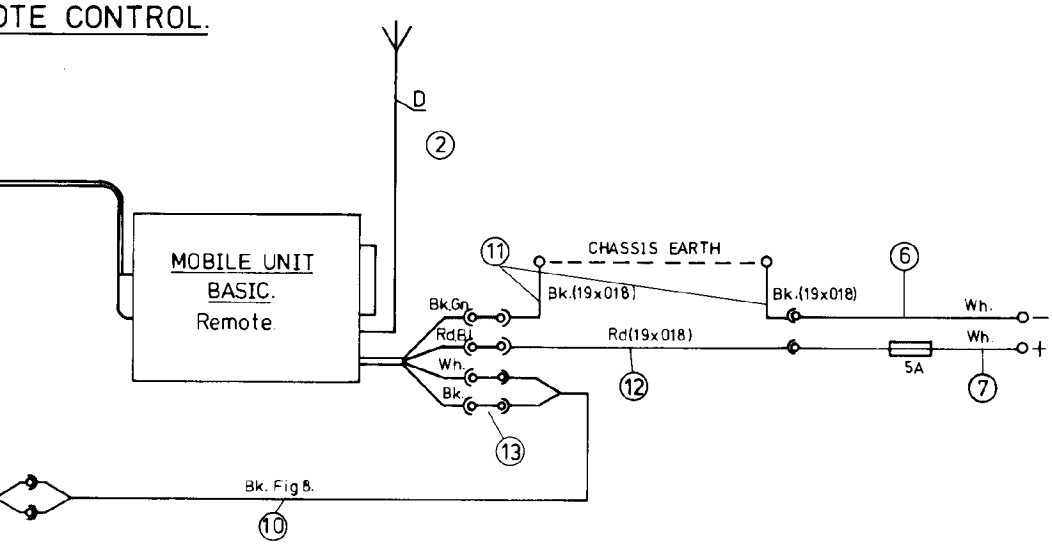
LOCAL CONTROL.



EXTENDED CO



OTE CONTROL.



UNITS

A MICROPHONE.
Pencil. 342200
H/Duty. 351677
Handset.

B BOX Speaker Assy.
6x2 342163
6x4 351678

C CONTROL UNIT.
VHF. 1 Ch. 351650
M/Ch. 351651
UHF. 1 Ch. 342430
M/Ch. 342431

D AERIAL
UHF 333151
VHF80. 333148
VHF160 333149.

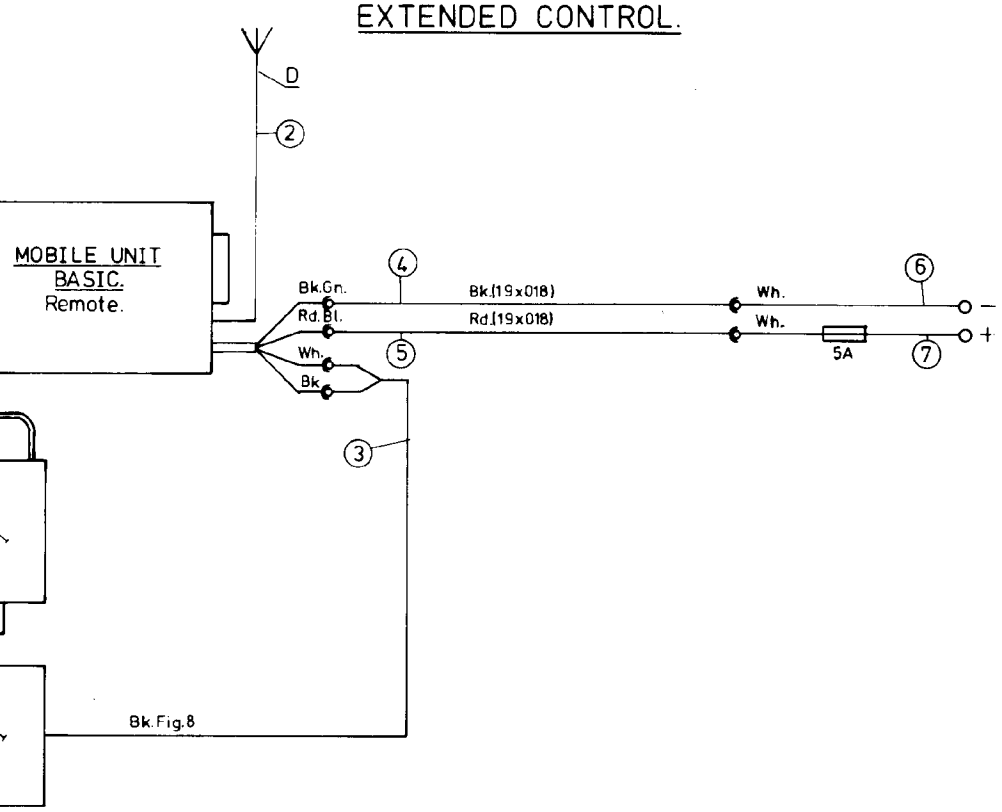
DIAGRAMS ILLUSTRATE NEGATIVE EARTH INSTALATION. FOR POSITIVE EARTH REVERSE LEADS 6 & 7.

FUSE MUST BE FITTED IN ACTIVE LEAD.

ISS.	DATE	CH.NO	5-6-78
SIGNATURES			
ISS.	DATE	CH.NO	
SIGNATURES			

INSTALATION DIA

EXTENDED CONTROL.



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UHF. 1 Ch. 342430
M/Ch. 342431

D AERIAL
UHF 333151
VHF80. 333148
VHF160 333149.

CABLES.

① CABLE Retractile 342209.
13"static. 50"ext. Part of microphone.
② CABLE Coaxial. 10ft c/w connector. BNC.
Part of aerial assy.
③ LEAD Assy 8ft 342163.
Part of BOX speaker assy's
④ LEAD Assy Bk. 90" ┐
⑤ LEAD Assy. Rd. 90" ┘ 342542 Assy.
⑤ LEAD Assy. Wh. 12" 342543
⑦ LEAD Assy. Wh. 12" Fused. 342548
⑧ CORD Connector Ended. 84"
1 Ch. 342394
M/Ch 342380
⑨ CORD Connector Ended. 10ft.
1 Ch. 351682
M/Ch. 351684
⑩ LEAD Assy. Bk. 10ft. 342525
⑪ LEAD Assy. Bk. 20ft. 342544
⑫ LEAD Assy. Rd 20 ft. 342545
⑬ TERMINAL Block 342547 or
Inline adaptor 342783 ┐ 2 off
Inline adaptor 342781 ┘

DIAGRAMS ILLUSTRATE NEGATIVE EARTH INSTALATION. FOR POSITIVE EARTH REVERSE LEADS 6 & 7.
FUSE MUST BE FITTED IN ACTIVE LEAD.

NOTE LEAD Assy's 11 or 12 to be cut as required for instalation.
Refer KIT Instalation for hardware details — 351680 Local & Extended Mtg
351681 Remote Mtg.

ISS	DATE	CH.NO	
SIGNATURES			
ISS	DATE	CH.NO	
SIGNATURES			

INSTALATION DIAGRAMS. Typical.

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Fig. 26